

THE IRON AGE

New York, June 8, 1916

ESTABLISHED 1855

VOL. 97: No. 23

Fixing Individual Wage Rates on Facts

BY GEORGE D. BABCOCK

Production manager, H. H. Franklin Mfg. Company, Syracuse, N. Y.

THE trend of recent industrial development is characterized by combinations of men in large groups and money in great amounts for the economical conduct of business. This evolution is due greatly to the fact that indirect or, as sometimes expressed "overhead," expense charges are not directly proportional to the number of workers employed. Instead, as the number of workers lessens in any single business, the indirect charges

due to equipment and service decrease in total value but they do so at a much less than proportional rate. Consequently the indirect charge per worker actually increases. Conversely, as the number of workers increases such charge per worker decreases. There is a limit where increase in numbers causes but slight decrease in indirect charge per worker. Beyond this point further enlargement of the group is not indicated for economical operation.

When business units were relatively small, those responsible for the direction of affairs were able to be in intimate contact with the details of the inanimate parts and to have personal acquaintance with each worker, knowing much of his particular characteristics. As the business grew to larger proportion, with opportunity for marked economies, favorable results failed to mature. It was evident that the personal efforts of the logical manager were no longer capable of satisfying the conditions, and delegated authority was introduced. The conference of delegates with the manager became the substitute for his personality and each delegate translated this personality as best he could. In large business groups, re-delegation was common and with each delegation a new translation of the original characteristics of the manager was introduced. Workmen in the offices and shops no longer knew the true manager nor appreciated his intent or needs in a true sense.

Recently there has been a marked change in those parts of the business conduct which refer chiefly to the control of inanimate things. With respect to the workers, however, little as yet has been accomplished. Periods of employment and methods of education are just being studied with very great benefit to all concerned. Practically nothing has been done so far to standardize the worker's values to the particular place of his employment. This has undoubtedly seemed an almost

Proficiency, Reliability, Continuity of Service, Indirect Charges, Increased Cost of Living and Periods of Lay-off Among the Factors Put to Measurement — Men Rated Periodically to Keep All of Equal Value to the Industry for the Money Paid to Them.

impossible task owing to the many variables which influence a conclusion. Upon the results of such a conclusion, however, depends the equitable promotion and demotion of workers, not in position alone but in wage earnings.

One principal explanation for the fact that the rate of workers' earnings has not increased with company prosperity is the attitude taken by workers that wages once raised must never be reduced. The management knew

little of the value of a worker and was forced to a destructive bargaining proposition. I feel that this is now unnecessary and that wage rates can be adjusted with entire satisfaction and with equity to the worker. It is another of the truths in business conduct that is just coming to light, that dealing with facts rather than opinions will establish equitable and satisfactory relations between managers and men.

For a considerable time, the writer has been applying a partial solution of this problem to his employees with marked successful results, chief of which is the ability to act under guidance of such facts as are usually only available to the manager in intimate personal contact with a few men.

The problem is complex due to the conditions imposed and only the essential elements have been considered. They are:

1. Rate of production.
2. Spoiled work or damage to equipment.
3. Years of continuous service.
4. Lateness and absences.

To this will be added, but with varying values, factors which depend on the local industrial problem. They are:

5. Number of major processes which worker can do.
6. Monetary responsibility which is placed in the hands of the worker.

Additionally, there is the general problem of co-operation and conduct. Co-operation in a special way, deserves credit, since it is unexpected. Any defect in conduct, since unexpected, should cause adverse criticism. It is not the intent at this time to discuss or reduce to factors either co-operation or conduct, although this is entirely possible. It rests chiefly upon an understanding with the workers that certain well defined acts of co-operation will bring extra reward and certain unsatisfactory conduct will cause definite penalties, ranging from re-

duction in wages to the condition where a man's actions or influence is incompatible to his supervisors and associates, with resulting discharge.

From a study of the elements above mentioned and a reduction of these elements to standard values, it has seemed possible to express their relation in the form of a mathematical expression. By a solution of this expression are obtained the relative values of those who work under its application. It is not my intent to offer this as a complete solution, but rather to analyze the strength or weakness of individual workers and from this decide on constructive action to culminate in compensation or criticism.

The various constants, such as percentages of increase per year of service, must be determined for each industry, but once established they are standardized for all workers; that is, if it is agreed that each year of service that a man is in steady employ is worth $2\frac{1}{2}$ per cent of the base rate, then this must be applied in all cases.

This equation is based on the premium method of payment, in which a man receives a minimum hourly wage rate and in addition is paid one-half of the time which he saves over the given set task time. The equation has further been determined with overtime paid at the rate of time and one-third.

The Equation and Its Elements

$$V = \left[K \left(\frac{B(1+i+m+ny) + R}{r(1+1.3E \mp 0.3e)} \frac{(1 \pm 2e)}{(1+0.3Pa) + s} \cdot P_t + \frac{B(1+i+m+ny) + R}{r(1 \pm 0.6(E \mp e))} \frac{(1 \pm e)}{(1+0.3Pa) + s} \cdot P_d + \frac{B(1+i+m+ny)}{r} \cdot P_l \right) \right] C$$

B represents the fundamental base rate. This is not the minimum rate of the worker at the particular time of his last rating but is the rate paid for classes of work upon which the worker was engaged at some definite time. In this particular case, the hourly rate paid labor for different classes of machine work as averaged over 1904, 1905 and 1906 has been standardized as the basis from which to compute. At that time, workers were paid for non-task work only. Premium was uncommon in this particular factory so services were sold by the worker without any expectation of extra reward.

i represents the per cent of increase in living cost since rate B was standard. The exact increase in the cost of living is very difficult to determine but after careful study by persons entirely capable, in this city (Syracuse, N. Y.), it was found that table commodities, clothing, assessed valuation of property, tax rates and fuel had increased approximately 50 per cent since 1905. Since the percentage in increase of living cost is applied to the base rate B of 1905 and since the living of workers at that time was measured by the base rate which they then received, it will be obvious that the increase in cost of living factor provides for the different conditions under which workers live at the present time. The base rates have been set for classes of skill and the percentage of increase for cost of living has been applied to the class under which the man is working at the time of rating and not to the class under which he entered the employ of the company. If in 1905, the worker was engaged on a low class of work and since has been able to increase his ability and do a higher class of work, the allowance for the increased cost in living will have kept pace with his proportionate increase in ability.

m is equal to the per cent of increase for training or ability. It is assumed that for any worker to be productive, he must be able to do at least one class of work without instruction. In the small shop employing a few workers but doing a great variety of things, each workman must have a broad training or be what is called an all-around mechanic. In the large industries, where there are a considerable number of workers and comparatively few things to do, one worker may in general be specializing a great percentage of his time. Between these two extremes there are a

It can be modified, however, to apply to any payment methods even to day pay-rates if known tasks are established.

The first term of the equation considers the worker when operating under set tasks. The second term, when he is not on task work but is operating at a minimum or day rate wage. The third term provides for the time in which a man is suspended from duty but has instructions from his supervisor to return to his work at a particular date, that is, the third term provides for a short time retainer.

In using this equation, constants are established for all factors for a standard workman. These values are introduced into the equation, which is solved for K when V is taken as 100. With V still maintained at 100 and K known, r is solved for any other worker. The rate r is the minimum rate per hour which each worker should receive to be of equal value with other workers to his particular industry.

I believe that every quality for good or bad that is worth consideration has some physical manifestation in the daily conduct of workers and that it can be measured if standards are adopted. With such standards as a basis, equity can be obtained for all workmen.

wide variety of combinations of these conditions. In the particular case here considered, where unexpected peak-loads occur, five major processes are considered desirable.

As typical these processes are:

1. Turret lathe operator.
2. Automatic machine operator.
3. Hand and power milling machine operator.
4. Punch press operator.
5. Precision grinding machine operator.

In each of these classes, it is assumed that the operator, without instruction and without regard to speed, can operate without spoiling work. The matter of speed and spoiled work is provided for in other factors of the equation. The term m is thus equivalent to the number, N , of major processes less 1 a worker can do, multiplied by the percentage factor allowed per process. In this particular case 0.04 is used. In the job shop, 0.06 would be too low a percentage factor; in the very highly specialized shop, 0.03 would be too high.

n is equal to the percentage of increase per year for continuous service. If a man is suspended for a short period, it is not considered as a break in employment and the number of years, y , of continuous service dates from the time he was first employed. In case he is absent for a considerable period of a year or more but was laid-off and did not resign, he will receive credit, on re-entering employment, for his previous years of service. That is, if a man worked three years continuously and was laid-off and did not return again into employment for two years and afterward was employed for one year, he would be credited as of four years' continuous service.

This recognition of the term of service is not intended to give credit for acquired knowledge by virtue of such service but rather to provide for that asset which continuous employment brings to the employment organization. First, it makes it less difficult to secure new workers and brings loyal support in times of special trouble. It also provides for a steady increase in the declining years of an employee, after his net earnings have begun to wane on account of slowness and because of spoiled work, absence and other contingencies of age.

R stands for the hourly fixed charges and expense for factory space, equipment, service and supplies provided for the man to work with. It is obvious that the individual worker, who maintains his own shop, solicits his own business and provides for all expenses incident thereto has a full appreciation of the relative value of his own labor to the charges upon the capital required to provide for his physical activity. This same equipment in the group organization, with common power, common light, building repairs and other incidental expenses, can be provided cheaper than by the individual worker. There is, however, a tendency on the part of the worker to undervalue the cost of preparation for his activities as well as the complete responsibilities for the maintenance of continuous economical activity. The addition of one piece of equipment to the shop may make possible a largely increased output with the same activity on the part of the worker as before, this equipment being an off-spring of mental productivity of which the worker was no part. With this equipment comes an added responsibility on the part of the worker, for with the equipment comes larger fixed charges. It is out of such equipment that increase in cost of living and increase for years of service is provided. Fixed charges go on continuously and can be offset only by continuous productivity.

With the introduction of ingenious but large and expensive automatic machinery, it has been assumed that the worker's wage could be lowered. This is a fallacy, for with the added responsibilities this places within his hands, due to the cost of maintenance of his equipment in running condition for rapid output, the ability and consequently the wage of the worker must be developed to correspond to prevent idling and repair losses. The same condition is met when men work upon expensive materials that are easily spoiled or when men work successively on a chain of operations, each costly. Then the responsibility of the man on the last operation is very much greater than that of the one working upon the first operation. In fact, there is a gradual ascending responsibility, and it is worth

while to consider the relative ability of the workers for each of these succeeding stages.

e represents the per cent of premium time earned by the man. In a premium system, the task set involves a certain length of time in which the job is to be done. With time study methods, the exact time in which a job is to be done is established. To this is added a certain amount of additional time, usually 60 per cent. It is expected that the worker will earn his normal rate for each hour plus this rate for one-half the time which he saves. This would then be time and about one-third in the particular case. The time saved so far as the factory is concerned will be twice the time earned, and the relative activity of the worker is measured by the time saved.

E stands for the per cent of earning expected from the set task; that is, not the time which the man does earn but the time determined from time study and set as the per cent of time which he should earn.

r is equal to the base rate per hour, which is to be determined by a combination of the variables.

Considering the given period of time from which the study is made:

- t* = number of hours of working on task.
- u* = number of hours of premium earned in this time.
- l* = number of hours of suspended time.
- d* = number of hours of non-task work.
- a* = number of hours absent or late.
- h* = total number of hours of work (*t* + *d*).
- P_a* = average absence per hour worked, equals *a*/*h*.
- P_t* = average per cent of each hour of task work, equals *t*/*h*.
- P_d* = average per cent of each hour of non-task work, equals *d*/*h*.
- P_l* = average per cent of each hour of suspended time, equals *l*/*h*.
- s* = average cost of lost effort per hour worked = value of spoiled work ÷ *h*.
- C* = 1 ± co-operation or conduct factor. This last coefficient, as has been mentioned, is determined by the establishment of standards in which each element of co-operation or conduct has a physical manifestation. For each standard a recompense or penalty has been agreed upon in conference with those chiefly affected, that is, the workers.

Evaluating Equation in Terms of *r* the Base Rate

Referring to the general equation.....

$$\begin{aligned} \text{Let } \frac{B(1 + i + m + ny)}{r} &= 1; \text{ also } C = 1. \\ \text{Let } D &= [B(1 + i + m + ny) + R](1 \pm 2e)P_t \\ F &= [B(1 + i + m + ny) + R](1 \pm e)P_d \\ p &= (1 + 1.3E \mp 0.3e)(1 + 0.3P_a) \\ q &= (1 \pm 0.6(E \mp e))(1 + 0.3P_s) \\ W &= \frac{V}{K} \end{aligned}$$

Substituting the equation becomes.....

$$\frac{D}{pr + s} + \frac{F}{qr + s} + P_l = W$$

Clearing of fractions, and expressing as a quadratic

$$(W - P_l) pqr^2 - [s(P_l - W)(p + q) + Dq + Fp]r + [(W - P_l)s - D - F]s = 0$$

$$\text{Let } a = (W - P_l)pq$$

$$\text{Let } b = s(P_l - W)(p + q) + Dq + Fp$$

$$\text{Let } c = [(W - P_l)s - D - F]s$$

The values for *r* will then be given by.....

$$r = \frac{b + \sqrt{b^2 - 4ac}}{2a} \dots \dots \dots (1)$$

SOLVING FOR A STANDARD WORKMAN

As an illustration of the application of the equation, a group of cylinder boring-machine operators may be considered, say workmen designated as clock numbers 622, 722, 640, etc. It is necessary first to establish the conditions corresponding to a standard workman of this class, and thus to ascertain the value of *K* in the general equation, so that *V* shall be equal to 100, the measure of the value to the industry of each workman.

Constants for Standard Workman: To Solve for *K* for Group Cylinder Boreers, Clock Nos. 622, 722, 640, etc.

<i>V</i> = 100	<i>E</i> = 0.42	<i>P_a</i> = 0.10
<i>B</i> = 0.256	<i>e</i> = 0.35	<i>P_l</i> = 0
<i>i</i> = 0.50	<i>r</i> = $\frac{B(1 + i + m + ny)}{1}$	<i>C</i> = 1
<i>N</i> = 2	<i>E</i> = 0.35	
<i>m</i> = 0.04 × (<i>N</i> - 1)	<i>P_a</i> = 0	
<i>n</i> = 0.025	<i>s</i> = 0	
<i>y</i> = 5	<i>P_l</i> = 0.90	

$$\text{As } r = \frac{B(1 + i + m + ny)}{1}, r = \frac{0.256[1 + 0.50 + 0.04(2 - 1) + 0.025 \times 5]}{1} = 0.256 \times 1.67 = 0.43, \text{ or 43 cents}$$

Workman's Value Report

Name *Wm. Blank*. Clock No. 622

April 14, 1916

Period Jan. 3, 1916, to March 11, 1916, inc. = 10 weeks

Present rate = \$.33 per hr.; new rate \$.40 per hr.; in effect April 17, 1916, to continue until June 15, 1916

Your Record		Standards	
e = per cent of task time earned	= .35	—	.35
s = per cent of spoiled and repaired work	= .005	—	.00
P _a = per cent of absence	= .02	—	.00
N = number of major processes	= 2	—	2
y = years of continuous service	= 2	—	5

Remarks

This is a good record but you can do even better with spoiled work and absence. If you earn full premium of 35 per cent on this new rate, your hourly earnings will be 54 cents per hour. Your record through the current period will increase or decrease your rate for the coming period.

Noted

Ordered

Dept. Foreman

Production Manager

Substituting the values in the main equation, we have:

$$100 = \left[K \left(\frac{[0.43 + 0.42] (1 + 2 \times 0.35) \times 0.90}{0.43 (1 + 1.3 \times 0.35 + 0.3 \times 0.35) (1 + 0.3 \times 0) + 0} + \frac{(0.43 + 0.42) (1 + 0.35) \times 0.10}{0.43 [1 \pm 0.6 (0.35 - 0.35) (1 + 0.3 \times 0) + 0]} + 0 \right) \right] 1$$

$$100 = K \left(\frac{1.3}{.58} + \frac{.115}{.43} \right) = K (2.24 + .27) = 2.5 K$$

$$K = 40$$

TO SOLVE FOR r FOR WM. BLANK, NO. 622

Period Jan. 3, 1916, to March 11, 1916, inc., = 10 weeks.

V = 100	R = 0.42	P _d = 0.03
B = 0.256	e = 0.35	P _t = 0
i = 0.50	r = ?	C = 1
N = 2	E = 0.35	K = 40
m = 0.04 × (N - 1)	P _a = 0.02	
n = 0.025	s = 0.005	
y = 2	P _t = 0.97	

Substituting these values in the expressions for D, F, p, q for use in equation (1), we have:

$$D = [0.256 (1 + 0.5 + 0.04 + 0.025 \times 2) + 0.42] (1 + 2 \times 0.35) 0.97 = 1.36$$

$$F = [0.256 (1 + 0.5 + 0.04 + 0.025 \times 2) + 0.42] (1 + 0.35) 0.03 = 0.03$$

$$p = (1 + 1.3 \times 0.35 - 0.03 \times 0.35) (1 + 0.3 \times 0.02) = 1.36$$

$$q = [1 + 0.6 \times (0.35 - 0.35)] (1 + 0.3 \times 0.02) = 1.01$$

$$W = 100 \div 40 = 2.5$$

Then the values of a, b and c are:

$$a = 2.5 \times 1.36 \times 1.01 = 3.43$$

$$b = 0.005 (0 - 2.5) (1.36 + 1.01) + 1.36 \times 1.01 + 0.03 \times 1.36 = -0.03 + 1.41 = 1.38$$

$$c = [(2.5 - 0) 0.005 - 1.36 - 0.03] 0.005 = -0.007$$

Then, from equation (1), is:

$$r = \frac{1.38 + \sqrt{1.90 + 0.10}}{6.86} = \frac{1.38 + 1.41}{6.86} = \frac{2.79}{6.86} = 0.40$$

r = \$0.40 per hour, the new rate.

Present rate = \$0.33 per hour.

Increase, \$0.07 per hour.

TO SOLVE FOR r FOR JOHN DOE, NO. 676

Period Jan. 3, 1916, to March 11, 1916, inc., = 10 weeks.

V = 100	R = 0.42	P _d = 0.20
B = 0.256	e = 0.25	P _t = 0
i = 0.50	r = ?	C = 1
N = 1	E = 0.35	K = 40
m = 0.04 (N - 1)	P _a = 0.10	
n = 0.025	s = 0.05	
y = 1	P _t = 0.80	

Substituting these values in the expressions D, F, p, q for use in equation (1), we have:

$$D = [0.256 (1 + 0.50 + 0 + 0.025) + 0.42] (1 + 2 \times 0.25) 0.80 = 0.97$$

$$F = [0.256 (1 + 0.50 + 0 + 0.025) + 0.42] (1 + 0.25) 0.20 = 0.20$$

$$p = (1 + 1.3 \times 0.35 - 0.3 \times 0.25) (1 + 0.3 \times 0.10) = 1.42$$

$$q = [1 + 0.6 (0.35 - 0.25)] (1 + 0.3 \times 0.10) = 1.09$$

$$W = \frac{V}{K} = 2.5$$

Workman's Value Report

Name *John Doe*. Clock No. 676

April 14, 1916

Period Jan. 3, 1916, to March 11, 1916, inc. = 10 weeks

Present rate = \$.30 per hr.; new rate \$.30 1/2 per hr.; in effect April 17, 1916, to continue until June 15, 1916.

Your Record		Standards	
e = per cent of task time earned	= .25	—	.35
s = per cent of spoiled and repaired work	= .05	—	.00
P _a = per cent of absence	= .10	—	.00
N = number of major processes	= 1	—	2
y = years of continuous service	= 1	—	5

Remarks

For a new man, you have done fairly well in premium earnings. If you will be more careful about the quality of your work, and more regular in your attendance during the coming period, your rate will go higher. Your record through the current period will increase or decrease your rate for the coming period.

Noted

Ordered

Dept. Foreman

Production Manager

Then the values of a , b and c are:

$$a = (2.5 - 0) \times 1.42 \times 1.09 = 3.87$$

$$b = 0.05 (0 - 2.5) (1.42 + 1.09) + 0.97 \times 1.09 + 0.20 \times 1.42 = -0.31 + 1.34 = 1.01$$

$$c = [(2.5 - 0) 0.05 - 0.97 - 0.20] 0.05 = -0.05$$

Then, from equation (1), is:

$$r = \frac{1.01 + \sqrt{1.02 + 0.77}}{7.74} = \frac{1.01 + 1.34}{7.74} = \frac{2.35}{7.74} = 0.305$$

New rate, \$0.30½ per hour.

Present rate, \$0.30 per hour.

Increase, \$0.00½ per hour.

GENERAL OBJECTS OF THE RATING SYSTEM

The practical examples of the application of the equation may seem to be extensively detailed. This would be true if substitution in the equation were required in each case. In practice, standard charts are worked out for all variables so that the values introduced in the quadratic equation are direct readings from the charts. All items of detail have been recorded in this article so that anyone caring to study this for a parallel research need have no unanswered questions.

From the workers' standpoint, it would seem that the factors B and C (the fundamental base

rate and the factor taking co-operation and conduct into account) would be the two which would offer any opportunity for co-operative determination.

Every manager of men as a regular duty must determine just who will be laid off or allowed to go, on account of a reduction of work at hand, or whether or not a worker or foreman should have an increase in wage. To solve this problem has been the chief cause of this study.

The results of this equation, as has been mentioned, should be used for guidance of the manager in determining which individuals require special attention that they may better their operating standards or overcome and correct faults. Under no circumstances should this be applied chiefly for the selection or discharge of workers. It is rigorous yet free from personal opinion, and provides the manager with an exact statement of relative abilities of different employees.

This is not proposed as a final or basic solution of the problem, but rather as one for preliminary use until something more exact or satisfactory can be determined. I hope that this may stimulate others to standardize the relations between supervisors and workers, yet preserving relations with the workers upon a purely individualistic basis.

ELECTRIC STEEL AT SHEFFIELD

Results of Furnace Operation—The Future of Competition with Crucible Steel

Sheffield's (England) equipment of electric steel furnaces is growing constantly, says a writer in the Engineering Supplement of the London Times. The output of alloy steels, which are extensively required for aeroplanes, automobile construction and other purposes, has undergone great development and electric furnaces have been installed chiefly for the manufacture of these materials. The total number of such furnaces now at work (February, 1916), or in course of erection in Sheffield, is fully 25, of which 15 were installed or ordered last year. The advisability of installing more of these furnaces is at present under consideration by several steel companies.

The prediction of a writer in THE IRON AGE that so far as the crucible process is concerned, the handwriting on the wall is plainly visible, is commented on editorially by the London Ironmonger as follows:

It is quite natural that Sheffield should be reluctant to abandon the crucible. Its tool steel enjoys a unique reputation for superiority in all parts of the world, and the discontinuance of a process which has given brilliant results, both in quality and profits, is necessarily a matter that calls for the most careful consideration. Another factor is the large amount of capital which is invested in crucible plants in Sheffield. It has been argued in the past that in the proximity of the coal-fields, coke melting is more economical than the use of the electric current, but experience may establish that the drawback of cost is outweighed by the gain in uniformity, higher refining and other advantages. At the moment crucible melting is extremely costly, owing to the price of coke having risen to nearly double the pre-war figures and to the dearness of crucibles. Whatever the truth may be as to the respective merits of the two processes in a center which has coal at its backdoor, and where the cost of electricity is comparatively high, the attitude of Sheffield toward the question appears to be veering round to the newer practice. There is great scope for the electric furnace outside the manufacture of tool steel. New kinds of steel are in demand which can be successfully made only in that furnace, and the call of the aeroplane, automobile and other progressive industries for steels of higher quality is compelling recourse to the same system.

To other statements in the same article in the London Ironmonger, a Sheffield metallurgist, Harry Etchells, takes exceptions in a communication to that paper as follows, discussing in particular the making of high speed steel in electric furnaces:

There are a few statements which may give a wrong impression to those about to take up this branch of industry.

Your article states that there are 8 furnaces, out of 15, at present making a high speed steel in Sheffield. This is hardly the case, as in Sheffield and elsewhere, the making of high speed steel in the electric furnace is still somewhat in the experimental stage, and at present nobody in Sheffield has succeeded in making high speed steel continuously in the electric furnace.

There is no doubt that with careful supervision high speed and any special steels can be produced in these large electric furnaces, but the advantage of large output is discounted considerably by the difficulties of casting ingots sufficiently small to comply with the cogging facilities of the local forges.

From a wide experience in the manufacture of high speed and special steel, I am convinced that the future of electrically made high speed steel does not lie with the large type of furnace at present generally installed, but with a small simple type of tilting furnace equipped with, say, two electrodes and a conducting hearth using 3-phase current. Such a furnace is now being made by T. H. Watson & Co., Sheffield, and it is arranged so that the steel can be poured directly into small molds, thereby facilitating the casting and finishing operations.

I should like to caution your readers against any furnace in which the electric current is distributed solely by suspended electrodes. The very valuable effect of a conducting hearth (which insures the steel being stirred up from the bottom) is quite lost in the simple type of arc furnace, and this is an important factor when melting special alloys. The Girod furnace or a modification of this type promises the best practical results.

Considerable success has apparently resulted from the use of the electric furnace in making high speed steel in the United States, as many as 10 furnaces being already engaged in this phase of the industry.

Harder Alloys of Copper

An alloy of copper, having a degree of hardness not usually obtained, is secured by incorporating with the copper not more than 1 per cent of any one of the alkaline earth metals, calcium, barium, strontium and magnesium, according to a patent (U. S. 1,169,392—Jan. 25, 1916) granted to F. C. Frary and Sterling Temple of Minneapolis and St. Paul, Minn., respectively. They assert that these alloys make sound castings, harder than pure commercial copper and of high electrical conductivity.

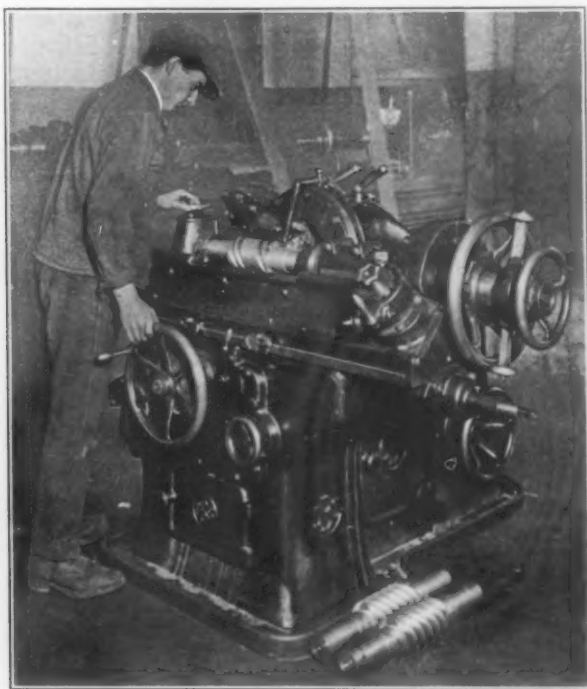
The Sloss-Sheffield Steel & Iron Company has placed with A. G. McKee & Co., Cleveland, Ohio, a contract for its new No. 2 furnace to be erected at Sheffield, Ala. The stoves of the present furnace will be used for the new stack, it being the intention to alternate the operation of the new furnace with the old stack.

Manufacture of Motor Truck Worm Drives

Processes at Timken-David Brown Plant
Include Milling and Grinding of Worm
Threads and Hobbing of Worm Wheels

—BY F. L. PRENTISS—

The use of the worm drive for motor trucks has resulted in important progress in the manufacture of worm gearing and the solving of manufacturing problems in securing accurate and rapid production. One of the important difficulties encountered was



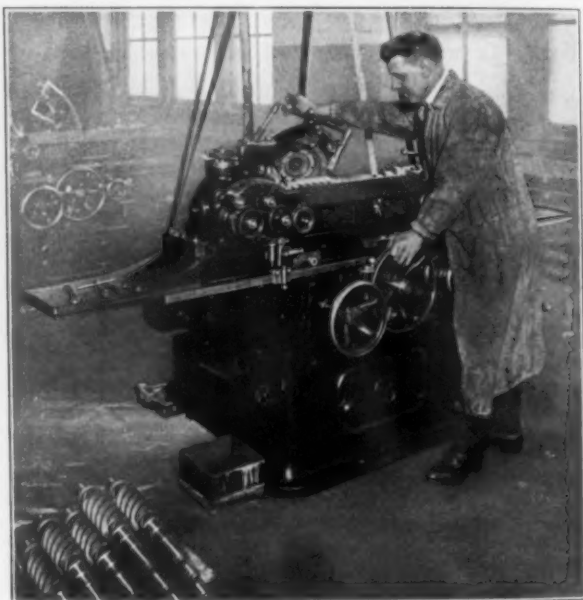
A Special Thread Milling Machine Cuts the Threads of the Worm

to secure correct thread forms on worms with large lead angles, the efficiency of the worm being increased with the increase of the lead angle. Worms are now being made with lead angles as high as 45 deg. The manufacture of worm gears for motor trucks has been developed extensively by the Timken-David Brown Company, Detroit, Mich., which is allied with the Timken-Detroit Axle Company, and the manufacturing processes of this company's plant are unusually interesting.

It is said that the three essentials to the success of worm gearing for motor trucks are that it must be accurately cut, accurately mounted and maintained in alignment and have proper lubrication. The forged steel blanks used for worms are low chrome-nickel carbonizing steel. The forged blank is first rough turned, then the thread is milled and the worm is carbonized. The taper and bearing seats are ground on standard grinding machines and then the threads are ground on special grinding machines. The worm wheels are made of a bronze alloy, bronze being used for the gears to secure higher efficiency and longer life of the worm drive. The gear is designed to bear a load over its entire surface without metal contact, the oil film bearing the load so that the coefficient of friction drops to a minimum. This oil film can be maintained only when the contacts are accurate. With the use of bronze, should there be any inaccuracy the worm

gear will reform itself to a considerable extent when proper operating conditions are restored.

In making worms the ordinary method is to mill out the space between the threads by a rotary cutter, the straight sides of which are made to slope at the normal pressure angle of the threads, the cutter being mounted on a spindle which is inclined normal to the lead angle of the threads. It is claimed, however, that the desired accuracy in the thread surface cannot be secured by this method. Worms at the Timken plant are produced on a special type of thread milling machine equipped with a rotary cutter, the actual shape of which is materially different from the thread surface that it cuts in the worm blank. A simple patented method is employed in generating the required shape of the cutter. The cutter form is obtained by employing a



After Hardening the Worm Threads Are Finished by Grinding on a Special Machine

generating tool consisting of a carrier that is gripped in the chuck jaws of the milling machine head and carries the tool holder which swivels about a pivot and can be clamped in any desired position. A straight edged steel tool is set in the tool holder at an angle corresponding with the pressure angle of the worm to be cut, the milling machine being geared for the lead which is desired in the finished worm. When the machine is started the carrier revolves and the edge of the tool traverses a spiral path corresponding to one side of the worm thread. A soft blank is then mounted on the cutter spindle in place of the usual cutter and is fed forward until it reaches the full cutting depth. The generating tool generates on this blank a curved surface that has the desired form for milling the correct thread surface in the steel bar, the shape varying according to the diameter, pitch, pressure angle and lead of the worm. A template is made from a soft blank and a hardened cutter is made to fit the template.

In milling the worm the cutter head slides toward the work, which is held in a collet. When fed to the correct depth the worm blank rotates on a table and the table travels in front of the cutter, milling a thread with each longitudinal travel of the blank, the operation being generally similar to that of an ordinary milling machine. Usually the worm has four or six threads. After one thread is cut the machine automatically indexes the next thread. The milling machine is heavy and rigid so that accuracy can be maintained under the heavy feeds and high cutting speeds essential to minimum production costs.

Distortions in the pitch, lead and lead angle of the worm are caused during the hardening process and these are removed by special automatic thread grinding machines. In order to grind the surface of the worm threads as true as they are milled it is necessary that the working face of the abrasive wheel be formed and maintained in the same shape as the flank of the thread milling cutter. This is accomplished by a generating tool which operates on the face of the abrasive wheel on the same principle as the generating tool used in the construction of the thread milling cutter. This consists of a carrier and tool holder similar to the device previously described. The tool is a round bar, near the outer end of which is mounted a diamond for dressing the grinding wheel. The carrier and tool holder contain a train of gearing which gives the tool a reciprocating motion, the gearing being driven by a rope belt, from an overhead shaft. In operation the carrier has the same spiral motion as the worm to be ground, the tool has a rapid reciprocating motion, and the diamond dresses the grinding wheel into the same essential contour as that of the milling cutter. After the grinding wheel is generated the thread surfaces on the worm are ground, the table on which the worm is mounted feeding the work against the wheel and the head turning the worm in accordance with the predetermined lead. When one lead of the worm is ground



Every Worm and Worm Wheel Are Tested for Accuracy of Machine Work

the head carrying the grinding wheel drops back and the table reverses its motion going back to its original position. The next lead is then indexed into position on the table, and the grinding head comes forward into position and the face of this lead is ground, this operation continuing until the worm has been ground to the proper pitch diameter. After grinding, the worm threads are buffed.

The worm gears are generated on a hobbing machine in two operations, the gears being first cut to form by a roughing hob which removes over 90 per cent of the metal cut away in generating the gear. Then the finishing cut is taken with a hob having a large number of teeth. The rotating table that carries the gear blank is supported near the periphery. The hobs are mounted on a sliding platen carried by an adjustable head, being fed along the position to be later occupied by the axis of the worm.

The worms are tested on a special testing machine with the master gear, and the gears with the master worm. To attain accuracy, various micrometer devices are used for testing after each operation.

The special thread milling and grinding machines and gear hobbing machines used in the plant were designed and built by David Brown & Sons, Ltd., Huddersfield, England, who have joint ownership with the Timken-Detroit Axle Company in the Timken-David-Brown Company.

Graphite in the United States in 1915

The output of natural crystalline graphite in the United States in 1915 increased about 1,580,000 lb. over that of 1914, according to the U. S. Geological Survey. The extraordinary activity was due to its use for crucibles in melting metals and as a foundry facing as well as to diminution of imports. While most established mines increased their output, new ones were opened, and the 1916 output is expected to be very large. Domestic output has not met the demand and the imports in 1915 exceeded those of 1914 in value but not in quantity, amounting to 23,075 net tons valued at \$2,241,163 which is about four times the value of the domestic output. Most of the imports came from Ceylon. The price of Ceylon graphite at the close of 1915 was twice that at the beginning of the year with freight rates at the end of 1915 five and one-half times as much as at the outbreak of the war.



Hobbing the Threads of the Worm Wheels

The annual fall meeting of the American Institute of Mining Engineers will be held at various mining centers in Arizona from Sept. 18 to 25, 1916.

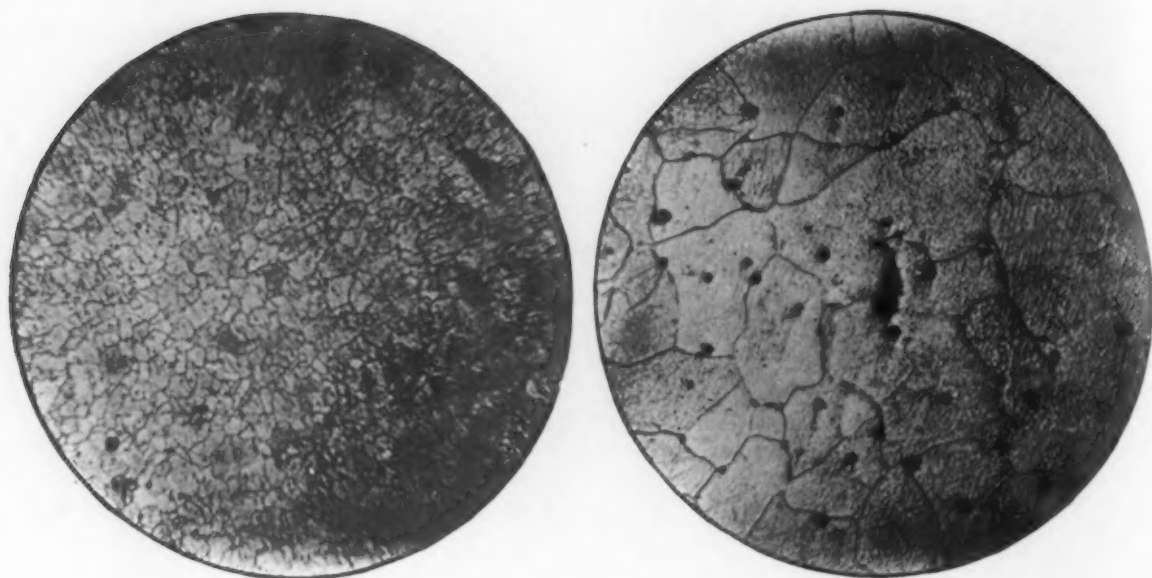


Fig. 1—Photomicrographs, 60 and 360 Diameters, of Pure Iron Made in an Open-Hearth Furnace. It is quite free from slag or other impurities; the minute spots are cavities caused by dispelled gases

VACUUM-MELTED PURE IRON

Open-Hearth Metal Purified and Magnetic Properties Greatly Improved

The remarkable magnetic properties obtained by melting electrolytically refined iron in a vacuum have been described by Trygve D. Yensen, research assistant professor, University of Illinois, in various communications in the last two years to the American Institute of Electrical Engineers. Similar results, obtained by melting iron-silicon alloys in a vacuum, have also been published by Professor Yensen, an abstract of these appearing in *THE IRON AGE*, Feb. 17, 1916.

It has been shown in these papers that it is possible to obtain by this process magnetic permeabilities as high as 50,000, accompanied by hysteresis losses of $1/5$ to $1/8$ that of the best commercial transformer steels now in use. The question has naturally arisen, says Professor Yensen, in an article contributed to *Metallurgical and Chemical Engineering*, "What effect will the vacuum treatment have upon commercial grades of iron?" An abstract of his answer to this question follows:

One of the purest grades of commercial iron obtainable was selected for an investigation, made by the open-hearth process and having only 0.16 per cent of impurities. Test pieces were prepared from this iron as it was received from the manufacturer and others were prepared from the iron after being remelted in vacuo. The test pieces consisted of rods, 1 cm. x 36 cm., used in connection with Burrows's compensated double bar and yoke method, and of rings, 4.2 cm. outside diameter x 3.8 cm. inside diameter, tested by the ordinary ballistic method. These test pieces before the final testing were annealed at 1100 deg. C. in vacuo and cooled at the rate of 30 deg. C. per hour to room temperature. The results are given in the table.

The vacuum treatment increased the maximum permeability from two to three times and decreased the hysteresis loss correspondingly. A similar improvement has been obtained with Swedish charcoal iron. For comparison the table also includes the results previously obtained with electrolytic iron, with and without silicon additions, melted in vacuo. This shows plainly that nearly as good results are obtainable using pure open-hearth iron as a base as with pure electrolytic iron.

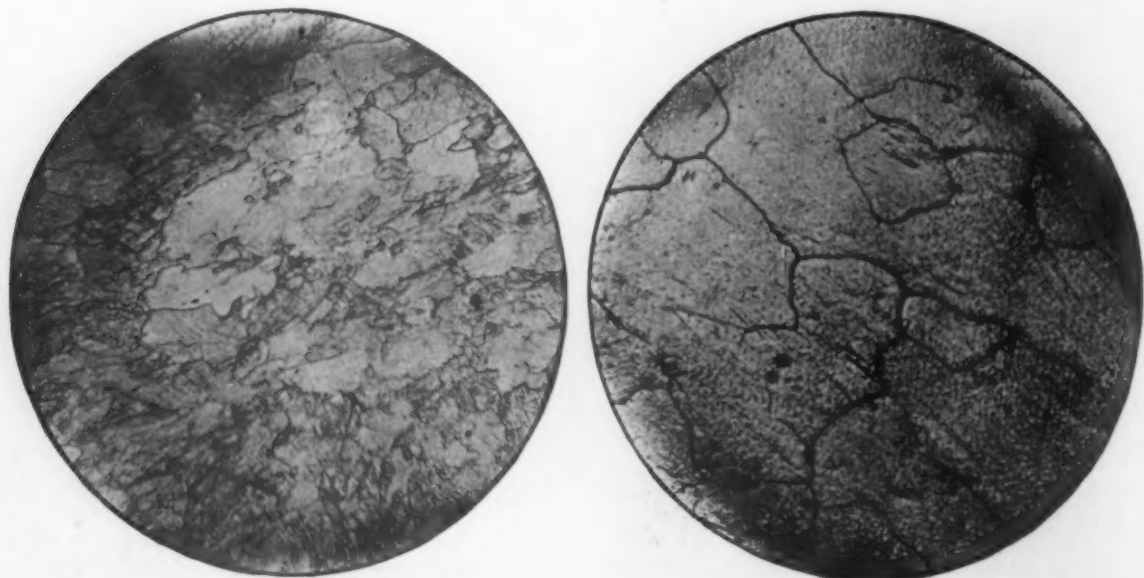


Fig. 2—Photomicrographs, 60 and 360 Diameters, of Open-Hearth Iron Remelted in Vacuo. It is freer of cavities than before the treatment and the crystals are larger

Chemical analysis shows little material difference between open-hearth iron before and after the vacuum treatment. This treatment, however, has materially reduced the CO and CO₂ gases. Density tests showed very slight differences between the treated and untreated iron, but out of a number of tests under different conditions and by different

Table 1—A Comparison Between the Magnetic Properties of Open Hearth Iron Before and After Being Remelted in Vacuo. Also Compared with Electrolytic Iron

Kind of Specimen	Maximum Permeability		Permeability		Hysteresis Loss, Ergs per Cub. Cm. per Cycle		Retentivity in Gaussens		Coercive Force in Gilberts per Cm.		Spec. Elec. Resist., Microhms
	Density for Maximum Permeability		B = 10,000	B = 15,000	B = 10,000	B = 15,000	B = 10,000	B = 15,000	B = 10,000	B = 15,000	
OPEN-HEARTH IRON, AS PURCHASED MACHINED FROM 1/4 INCH ROD. ANNEALED AT 1100 DEG. C.											
Rod	7,250	10,000	7,250	2710	....	5550	9000	13,000	.85	1.0	10.15
OPEN-HEARTH IRON REMELTED IN VACUO, ANNEALED AT 1100 DEG. C.											
Ring	14,300	8,500	13,700	5700	986	2063	8400	12,300	.33	.39	10.05
Rod	14,180	8,500	13,200	5350	1080	2190	8700	12,300	.37	.40	
Ring	16,500	9,500	16,450	6400	935	2010	8700	13,900	.30	.35	10.20
Ring	17,000	9,000	16,700	8250	852	1755	8400	12,600	.28	.33	
Rod	20,900	9,000	20,200	7500	865	1760	9300	13,600	.30	.34	
Ring	16,300	10,000	16,300	6000	870	1880	8400	13,300	.30	.35	
ELECTROLYTIC IRON MELTED IN VACUO, ANNEALED AT 1100 DEG. C.											
Rod	22,800	8,000	21,300	1365	665	1860	9300	13,300	.20	.24	9.84
Rod	25,800	9,000	25,600	1365	707	1451	9300	12,700	.23	.28	9.85
ELECTROLYTIC IRON WITH 0.15 PER CENT SILICON MELTED IN VACUO, ANNEALED AT 1100 DEG. C.											
Rod	66,500	6,500	41,700	6000	286	916	9080	12,000	.09	.165	11.80
ELECTROLYTIC IRON WITH 3.0 PER CENT SILICON MELTED IN VACUO, ANNEALED AT 1100 DEG. C.											
Ring	36,200	8,000	31,300	790	337	757	7700	11,000	.09	.10	44.75
Rod	72,600	9,000	69,500	2500	254	926	9400	13,700	.09	.16	

persons the density of the vacuum treated iron was in every case higher, the average difference being about 0.1 per cent.

Photomicrographs, Figs. 1 and 2, show the open-hearth iron, untreated and treated *in vacuo*. While the untreated iron, Fig. 1, is unusually free from slag and other impurities such as the dark spots caused evidently by expelled gases, the vacuum-treated iron, Fig. 2, is practically free from such cavities, and the crystals are also much larger.

Results obtained thus far seem to indicate that the purer the iron the larger the crystals. Previous results also point to a possible connection between high magnetic permeability and large crystals, when comparing irons of the same general composition having received the same mechanical and heat treatment. There is a question whether magnetic permeability has anything to do with the crystal size as it may depend solely on the purity of the iron.

The conclusion may be drawn that open-hearth iron has been purified by the vacuum treatment to a degree not obtainable by any ordinary process and also that this purification has resulted in marked improvements in the magnetic properties. With the results obtained with Swedish iron, these investigations show definitely that it is possible to obtain magnetic properties with commercial irons by vacuum fusion, comparable with those obtainable with electrolytic iron.

High Temperature Furnace Cement

A furnace cement which will withstand temperatures as high as those to which fire clay should be subjected was described at a meeting on May 3 of the Philadelphia Foundrymen's Association by W. S. Quigley, president Quigley Furnace Specialties Company, Inc., New York. The cement, which is known as "Hytempite," is plastic, trowels easily and insures a tight wall or structure which will prevent the passage of gases or foreign substances such as dust, ashes, etc. It is not injured by expansion of the joint, it is claimed, and can be applied under heat while wet without injury.

This cement used as a binder in place of fire clay forms a joint when air set which, he said, is as strong as the material united and that the strength of the joint increased by the action of heat. Fire clay must be fused before a bond is obtained. The cement also will withstand the cutting action of flames, he continued, and is especially adapted for oil furnaces where the gases are of high velocity, and for furnace roofs, door arches, bung tops, boiler settings, etc. It also can be used as a coating or wash to smoothen or harden a surface of a furnace lining to protect it from abrasion.

The temperatures which fire clay bricks will withstand are usually much overrated. Out of 56 samples of the best brands of fire clay brick tested by the Bureau of Standards to determine the melting points, but one brick withstood a temperature of 3135 deg. Fahr. and the average melting temperature was considerably under 3000 deg. Fahr.

TESTS MADE IN LECTURE HALL

A series of experiments were conducted in connection with the presentation of the paper. Two electric furnaces, one for temperature up to 2000 deg. Fahr. and the other for temperatures up to the melting point of fire clay, were used, together with suitable pyrometers for temperature indications. In the first test two samples of Queens Run brand bricks were buttered with a small quantity of the cement, placed in the small furnace and heated to 1900 deg. Fahr. One of these samples was then transferred to the larger furnace and heated to a temperature of 2800 and 2900 deg. Fahr., or until it softened. The low-temperature test showed that there was no unequal expansion of the joint or boiling out of the cement from the joint. The high-temperature test softened the brick so that they were with difficulty removed from the furnace, yet the joint was scarcely visible and there was no apparent fluxing action at the joint. Fire clay brick made up with an ordinary fire clay wash fell apart immediately upon handling after being subjected to a temperature of 2000 deg.

A second test consisted in making up joints between Woodland brand brick, the joint being air-dried before being subjected to high temperature. One joint was heated to 2000 deg. Fahr. and the other heated to a softening temperature. In this test also the joints behaved as in the previous test.

The final test was the cementing of a Jersey clay brick and bringing the joint as close as possible to the fusion point without actually melting the brick in order to demonstrate the strength of the joint at an extremely high temperature. In this test the brick became so soft that it adhered to the bottom of the furnace, and yet the strain of removing the bricks from the furnace by grasping the upper one but slightly opened the cemented joint.

E. I. Du Pont de Nemours & Co., Wilmington, Del., have issued a booklet dealing with their products and those of their subsidiary companies. In all some 251 distinct commodities are listed, the booklet being divided into sections dealing with explosives and blasting supplies; fabrikoid, a substitute for leather; chemicals and pyralin, a substitute for ivory and shell.

A metal turning of 0.55 per cent carbon steel, indicating a depth of cut of ¼ in. and a feed of ¼ in., was noted in the possession of Carl G. Barth, consulting engineer, Philadelphia, at the recent meeting at Ann Arbor of the Taylor Society. The chip was cut with a stellite tool at a speed of 85 ft. per minute.

The Economical Use of Blast Furnace Gas

Methods Which Will Increase the Efficiency in the Utilization of Blast Furnace Gas by Hot Blast Stoves and Boilers



A. N. DIEHL

pany, at the Cleveland meeting of the American Iron and Steel Institute, last October.

Mr. Diehl stated that about 48 to 50 per cent of the thermal value of the fuel used in the blast furnace passes from the top in the form of sensible and latent heat in the gas. Of this about 30 per cent is used in the hot blast stove, 10 per cent is lost, and 60 per cent is used in the boilers and engines. The possibility of raising the boiler efficiency from 55 to 65 per cent in burning the blast furnace gas has, he argues, been almost overlooked.

The average blast furnace gas on lake ores has approximately the following analysis by volume: CO₂, 12.5 per cent; CO, 25.4 per cent; H₂, 3.5 per cent; nitrogen, 58.4 per cent. This gas will have a thermal value at 62 deg. Fahr. and 30 in. barometer of 92 B. t. u., and contains from 30 to 35 gr. of water per cubic foot. It also contains considerable dust, which, however, can be removed by washing, the dust content being lowered from 3 gr. to approximately 0.2 gr. a cubic foot, the moisture at the same time being lowered from 30 gr. to 8 to 10 gr. per cubic foot. While washing the gas reduces its temperature 220 deg.; this is counterbalanced by the gain due to the cleanliness of the heating surfaces with the washed gas and by the reduction of moisture. Equally high flame temperatures can be obtained from either clean or dirty gas, the temperatures being in the neighborhood of 2030 deg.

The performance of a burner, Mr. Diehl suggests, may be determined by the observation of flame tem-

perature, and by analysis of the products of combustion. The temperature observation cannot be used as an absolute standard of burner efficiency, and a method based on the analysis of the products of combustion must be used. A burner is put at 100 per cent efficiency when the analysis of the products of combustion show only carbon dioxide and nitrogen. It is suggested that the products of combustion be analyzed at a point about 2 ft. from the point of ignition. The 100 per cent efficient burner is accordingly defined as follows: "A gas burner is operated at 100 per cent combustion efficiency when the analysis of a sample, drawn from a point 2 ft. beyond the point of ignition, shows perfect combustion."

Under this definition the boiler efficiency does not enter into the problem, and burners may be compared with one another. The efficiency of burners varies with the load upon them, and it is desirable to develop a burner that will closely approach perfection at boiler loads of 75 to 200 per cent of the boiler rated horsepower. The essential condition for this is a maximum flame temperature obtained by a perfect mixture of air and gas in the burner. The burners which are discussed below, however, cannot be compared on the basis of burner efficiency on account of insufficient data.

Blast furnace gas burners, according to Mr. Diehl, may be classified under six general types. These are described below, and the performance of typical burners of several types under hot stoves is given in Table 1.

The following points should be observed in using blast furnace gas in burners in connection with stoves: Clean gas should be used when possible. Large heating surfaces should be exposed as an aid in lowering stack temperatures. Equal draft and blast distribution over the entire checker area is essential to good practice. All gas should be consumed in the combustion chamber. The closer the complete combustion is to the burner, the better heating exchange is possible. It is best to add both gas and air at only one point, through the burner, and control them there. Gas and air have channeling tendencies when entered separately. Forced draft will facilitate flame intensity and it acts in such a manner as to make combustion of more gas possible in the stove than under atmospheric conditions. If the stove is sufficiently large, considerable advantage can be derived by this method. It is advisable to make daily flue gas analyses and have a technical supervision of the combustion.

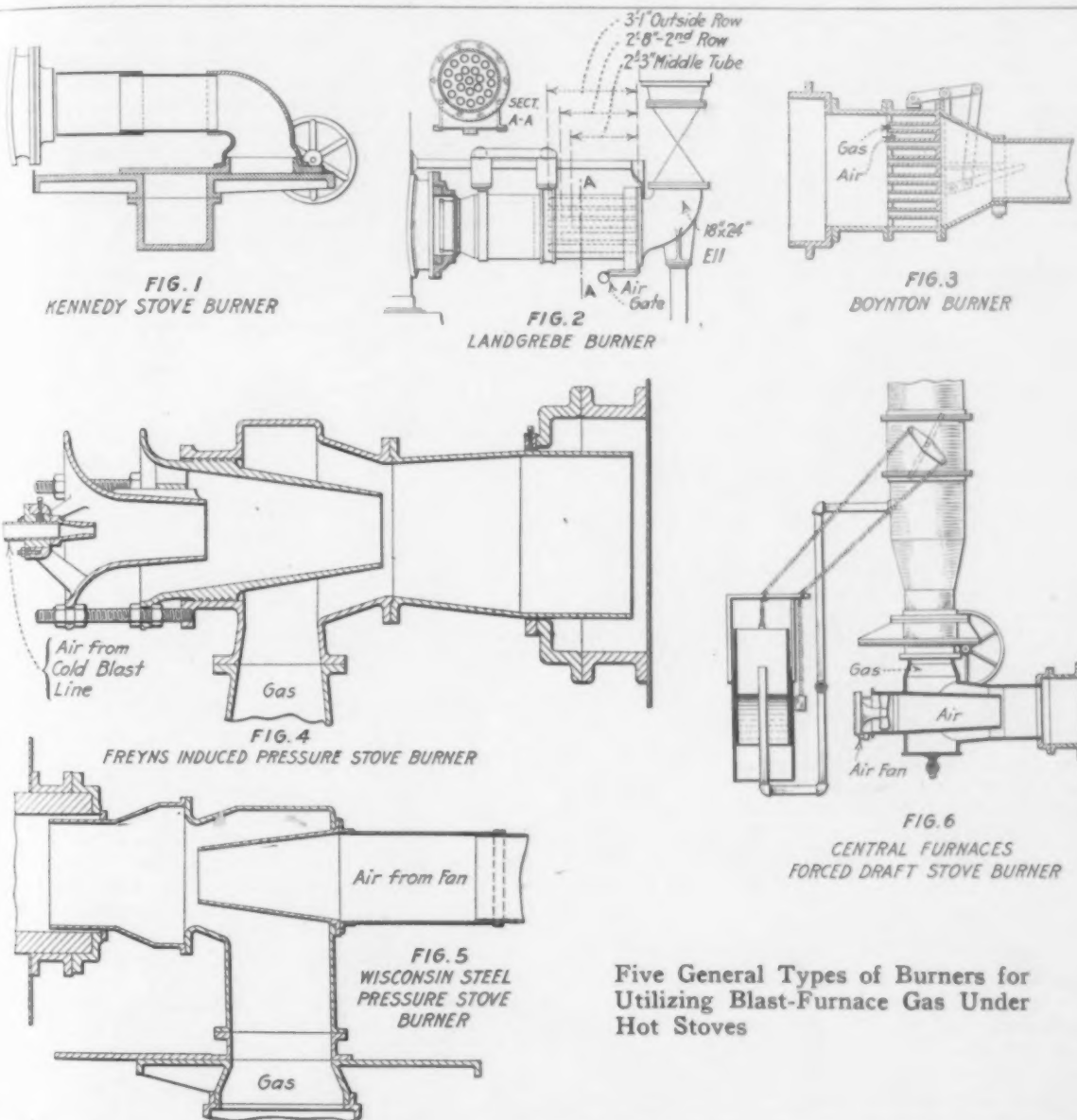
Table 1—Comparative Performance of Burners and Stoves

Item	Duquesne	Edgar Thomson	Wisconsin Steel Co.	T. C. I. & R. R. Co., Ala.	National Tube Co., Lorain, Ohio	Ohio Works, Carnegie Steel Co.	Edgar Thomson	Wisconsin Steel Co., South Chicago
Location	1	1	1	2	3	2	3	5
Type of burner	2-pass cent. clean	2-pass clean	2-pass clean	2-pass clean	2-pass clean	2-pass clean	2-pass clean	2-pass clean
Type of stove	comb. cham.	2-pass clean	2-pass clean	2-pass clean	2-pass clean	2-pass clean	2-pass clean	2-pass clean
Condition of gas	clean	clean	clean	clean	clean	clean	clean	clean
Size of stove, ft.	21 x 96	22 x 100	22 x 90	22 x 110	21 x 115	21 x 115	22 x 100	22 x 90
Heating surface, sq. ft.	39,920	51,192	33,000	53,700	53,700	53,700	51,192	37,000
Cubic contents, cu. ft.	17,974	8,894	35,000	49,700	5,349	5,349	8,894	35,000
Air blown per minute at 62 deg., cu. ft.	40,580	37,744	35,000	49,700	39,600	39,600	44,748	35,000
Temperature, hot blast, deg. F.	1,076	1,200	1,165	1,200	1,200	1,200	1,119	1,273
Temperature, stack, deg. F.	612	537.5	761	437	800	780	376	598
Time on gas, min.	198.75	172.25	236	205	170	170	161.8	55
Time on blast, min.	64.0	60.0	73	55	60	60	60	148
Furnace gas analysis:								
CO ₂ , per cent.	13.06	11.94	15.1	10.92	12.9	12.9	11.78	15.1
CO, per cent.	25.78	24.84	23.6	32.72	26.4	26.4	26.38	23.6
H ₂ , per cent.	3.69	4.45	3.0	1.04	3.4	3.4	3.15	3.0
N ₂ , per cent.	57.47	59.77	58.3	54.56	57.3	57.3	58.76	58.3
CH ₄ , per cent.	.....	.....	.....	0.16	.....	.....	.....	.....
Flue gas analysis:								
CO ₂ , per cent.	21.30	18.08	25.0	24.40	24.5	24.0	23.60	24.8
O ₂ , per cent.	2.90	4.93	1.0	1.70	0.0	0.7	1.87	1.3
CO, per cent.	0.8	0.0	0.0	0.0	0.8	0.0	0.45	0.0
N ₂ , per cent.	75.0	76.99	74.0	73.90	74.7	75.3	74.08	73.9
Heat absorbed by blast (efficiency), per cent.	64.48	58.04	61.5	74.1	56.4	59.7	71.58	69.4
Sensible heat lost in flue gas, per cent.	22.22	23.41	26.5	13.2	29.5	30.3	10.50	18.6
Unconsumed CO lost, per cent.	4.52	0.0	0.0	0.0	4.1	0.0	9.46	0.0
Radiation unaccounted for, etc., per cent.	8.78	18.45	12.0	12.7	10.0	10.0	8.46	12.0

Boilers

The boilers in operation at the present time in blast furnace plants range from 250 to 500 hp. They are usually equipped with feed-water heaters but seldom with superheaters or economizers. Settings and baffles as a rule are in bad condition, and the efficiency of the

average blast-furnace boiler plant could probably be increased from 5 to 10 per cent by repair and constant upkeep of settings and baffles. The burner in general use comprises a pipe introduced into the combustion space under the boiler. The gas enters in a solid rectangle or circle and the air in a thin layer around it. Air and gas are mixed in combustion chamber and



Five General Types of Burners for Utilizing Blast-Furnace Gas Under Hot Stoves

1. A rectangular or circular nozzle burner with air added around it or by separate doors or both. An example of this type is the Spearman and Kennedy burner, Fig. 1. Air enters the stove through the clearance space around the burners and through doors in other parts of the stove circumference. Gas and air mix in the combustion chamber.

2. Rectangular or circular burner with air conducted into the gas jet by means of pipe or other opening. The Landgrebe burner, Fig. 2, is of this type. Air is admitted at the back of the gas tubes, and at the ends of them meets the gas, at which point mixing takes place. A separate gas valve is placed in the pipe connection to the gas main, and suitable slides, etc., are provided for regulating admission of air into the air chamber of the burner.

3. Burners which subdivide air and gas into a series of streams but do not mix in the burners. A burner of this type, developed at the Edgar Thomson Works of the Carnegie Steel Company, consists of two concentric passages, the inner one for gas and the outer one for air. The gas and air passages contain helically twisted vanes, the twists in the two helices being in opposite directions. The vanes run the full length of the respective barrels and serve to facilitate the mixture of the gas and air when they emerge from the burner. Another example of this class of burner is the Boynton burner, in use at the Lorain works of the National Tube Company. It is illustrated in Fig. 3. Air and gas are admitted in horizontal

layers, this stratification being produced with the idea of obtaining an intimate mixture of air and gas at the point of admission. No test data are available on this type of burner.

4. A burner in which air is aspirated by means of an air jet at high pressure, as in a steam jet blower, the air from both sources mixing with the gas in the burner. The Freyn gas burner is of this type, and is illustrated in Fig. 4. These burners have been used on stoves of the Illinois Steel Company at South Chicago, but Mr. Diehl had no test data in regard to them.

5. Burners through which all of the required air is forced and completely mixed with the gas before the ignition point. Fig. 5 illustrates a burner of this type in use on the stoves of the Wisconsin Steel Company of South Chicago. Another form of the same type is used at the American Steel & Wire Company's Central furnaces at Cleveland. The burner used at the Central furnaces is illustrated in Fig. 6. Air is supplied by a 16-in. turbo-blower which runs at a constant speed and therefore furnishes the required volume of air at a given rate. A gasometer-controlled damper placed in the gas downtake insures a correspondingly constant gas volume.

6. Burners to which air and gas are supplied after being perfectly mixed in a fan which draws in air on one side and gas on the other, discharging the mixture into a common outlet. This type of burner is at present in process of development and no data are available as to its performance.

in the boiler, the bulk of the work being done in the latter. The only method of controlling gas pressure and quantity is a butterfly valve placed in the supply line to the boilers. This method of control is used in order to insure the required pressure at all times at the gas cleaning plant, which is necessary to insure that the constant quantity of gas required by the stoves and the gas engines shall always be maintained. The variation in quantity and pressure of gas must be taken by the boilers. Pressure regulation at the boilers cannot be considered, and an amount of air proportional to the quantity of gas available must be supplied. This can be done in most equipments by means of damper regulation, in combination with sufficient air openings around the burners. Automatic damper regulation, controlled by pressure in the gas box between the butterfly valve and the burner, will probably give the best results.

When raw gas is used, the boiler tubes should be blown regularly. Under constant conditions, stack temperatures have shown decreases of from 50 to 100 deg. Fahr. before and after blowing. On account of the loss due to excessive air leakage through the open doors, while the tubes are being blown, the economical period of blowing is every 12 hr. After the 12-hr. interval the deposits accumulate rapidly, causing a correspondingly rapid rise in the stack temperature.

Three general types of burners are in use in connection with boilers as follows: 1. Rectangular or circular nozzles, with air added around them or by separate air doors, or by a combination of both. 2. Rectangular or circular burners with air conducted into the gas jet by means of pipes or other openings, and by means of auxiliary doors through which additional air is admitted around the burner nose. 3. Rectangular or circular burners with all the air required for combustion conducted into the gas jet by means of pipes or other openings. Type 1 is known as the common burner.

DISTRIBUTION OF BOILER LOSSES

The maximum average efficiency of a blast furnace boiler plant, using common burners and operating without the aid of technical supervision, is about 50 per cent, frequently being lower. An approximate distribution of the losses is about as follows:

Sensible heat in waste gases.....	36 per cent
CO in waste gases.....	9 per cent
Radiation	5 per cent

The distribution of the loss will, however, vary greatly with the load, the gas pressure, and the position of the stack damper.

The results of the 28 eight-hour tests at the Duquesne works of the Carnegie Steel Company on 250-hp. Babcock & Wilcox boilers are condensed in Table 2, which shows the variations in different losses and efficiency.

Table 2—Summary of Boiler Tests at Duquesne Blast Furnaces Boiler Plant

	Max. Stack Loss.	Min. Stack Loss.	Max. Eff.
Per cent of ratings developed.....	110	112	125
Furnace gas analysis:			
CO ₂ per cent.....	13.4	13.0	13.2
CO per cent.....	24.8	25.5	25.5
H ₂ per cent.....	3.6	3.5	3.6
Combustion chamber analysis:			
CO ₂ per cent.....	16.9	19.6	21.2
O ₂ per cent.....	7.5	9.2	1.4
CO per cent.....	1.0	8.1	6.1
Stack gas analysis:			
CO ₂ per cent.....	8.1	16.1	18.2
O ₂ per cent.....	14.3	5.9	6.4
CO per cent.....	0.9	3.5	0.2
Gas pressure, inches.....	3.5	4.0	3.5
Draft in furnace, inches.....	0.30	0.35	0.42
Furnace gas temperature, deg. Fahr.	60	300	60
Combustion chamber temperature, deg. Fahr.	1,706	1,690	1,765
Stack temperature, deg. Fahr.	628	565	785
Calorific value of furnace gas, cu. ft., B.t.u.	90.3	92.3	91.0
Sensible heat of furnace gas, cu. ft., B.t.u.	0.0	4.8	0.0
Total heat of furnace gas, cu. ft., B.t.u.	90.3	97.1	91.0
Sensible heat lost in stack, per cent	59.1	22.2	34.1
Unconsumed CO lost in stack, per cent	0.0	23.8	1.5
Radiation (assumed)	5.0	5.0	5.0
Efficiency, per cent.....	35.9	49.0	59.4

The maximum efficiency occurs with neither a minimum sensible heat loss nor minimum CO loss, which is generally the case with high efficiency. The efficiency of 59.4 per cent may be considered about the maximum under present conditions and equipment. It indicates that with attention to details of operation, a continuous operating efficiency of about 58 per cent is possible at a rate of driving of 175 per cent of rated boiler horsepower. While this is a low figure, it is probably exceeded by but few blast furnace boiler plants. High efficiencies are possible, however, with old style burners, provided they are used in connection with large boilers, long combustion chambers, excellent conditions of setting and baffles, sufficient air supply and air regulation, together with close attention to performance. This is shown by the performance of a 500-hp. Babcock & Wilcox boiler at the National Tube Company's plant at McKeesport, Pa. A representative test of these boilers is shown in Table 3. The arrangement of the boiler is shown in Fig. 15.

Table 3—Test of 500-Hp. B. & W. Boiler with Old Style Burner

Per cent of rating developed.....	155
Furnace gas analysis:	
CO ₂ per cent.....	13.0
CO per cent.....	25.6
H ₂ per cent.....	3.2
Combustion chamber analysis:	
CO ₂ per cent.....	24.7
O ₂ per cent.....	0.1
CO per cent.....	2.0
Stack gas analysis:	
CO ₂ per cent.....	21.2
O ₂ per cent.....	3.7
CO per cent.....	0.6
Furnace gas temperature, deg. Fahr.	300
Combustion chamber temperature, deg. Fahr.	2,040
Stack temperature, deg. Fahr.	545
Calorific value of furnace gas per cu. ft., B.t.u.	91.9
Sensible heat of furnace gas per cu. ft., B.t.u.	4.8
Total heat of furnace gas per cu. ft., B.t.u.	96.7
Sensible heat loss in stack, per cent.	19.0
Unconsumed CO loss in stack.....	3.7
Radiation (assumed)	5.0
Efficiency	72.3

COMPARATIVE RECORDS OF BIRKHOLZ AND COMMON BURNERS

A representative form of a burner of the second class is the Birkholz-Terbeck burner, shown in Fig. 7. In this burner the primary air supply is admitted through openings in the back of the air nozzle, being aspirated by the force of the gas blowing through the burner. The primary air supply is insufficient, and a secondary supply is drawn in by furnace draft through the secondary openings around the nose of the burner. Table 4 is a comparative record of the performance of one of these types of burners and of a common type burner which was operated simultaneously on two 325-hp. Rust boilers in the same battery at the South Works of the Illinois Steel Company.

Table 4—Comparative Test of Common and Birkholz Type Burners

	Common	Birkholz-Terbeck
Per cent of rating developed.....	130	130
Furnace gas analysis:		
CO ₂ per cent.....	14.0	14.0
CO per cent.....	25.0	25.0
H ₂ per cent.....	3.6	3.6
Stack gas analysis:		
CO ₂ per cent.....	21.4	22.8
O ₂ per cent.....	3.8	2.8
CO per cent.....	0.0	0.3
Gas pressure	0.15	0.7
Furnace gas temperature, deg. Fahr.	45	45
Stack temperature	872	823
Calorific value furnace gas, cu. ft., B.t.u.	91.6	91.9
Sensible heat of furnace gas, cu. ft., B.t.u.	0.3	0.3
Total heat of furnace gas, cu. ft., B.t.u.	91.6	91.6
Sensible heat lost in stack, per cent.	36.6	32.8
Unconsumed CO lost in stack.....	0.0	1.8
Radiation (assumed), per cent.....	5.0	5.0
Efficiency, per cent.....	58.4	60.9

A series of tests, made by C. J. Bacon on Stirling, Rust and Wheeler boilers was reported. The object of the tests was to compare the Birkholz burner with those of the so-called simple construction. The tests were all of short duration and the evaporation was measured by steam flow meters instead of by weighing the feed water.

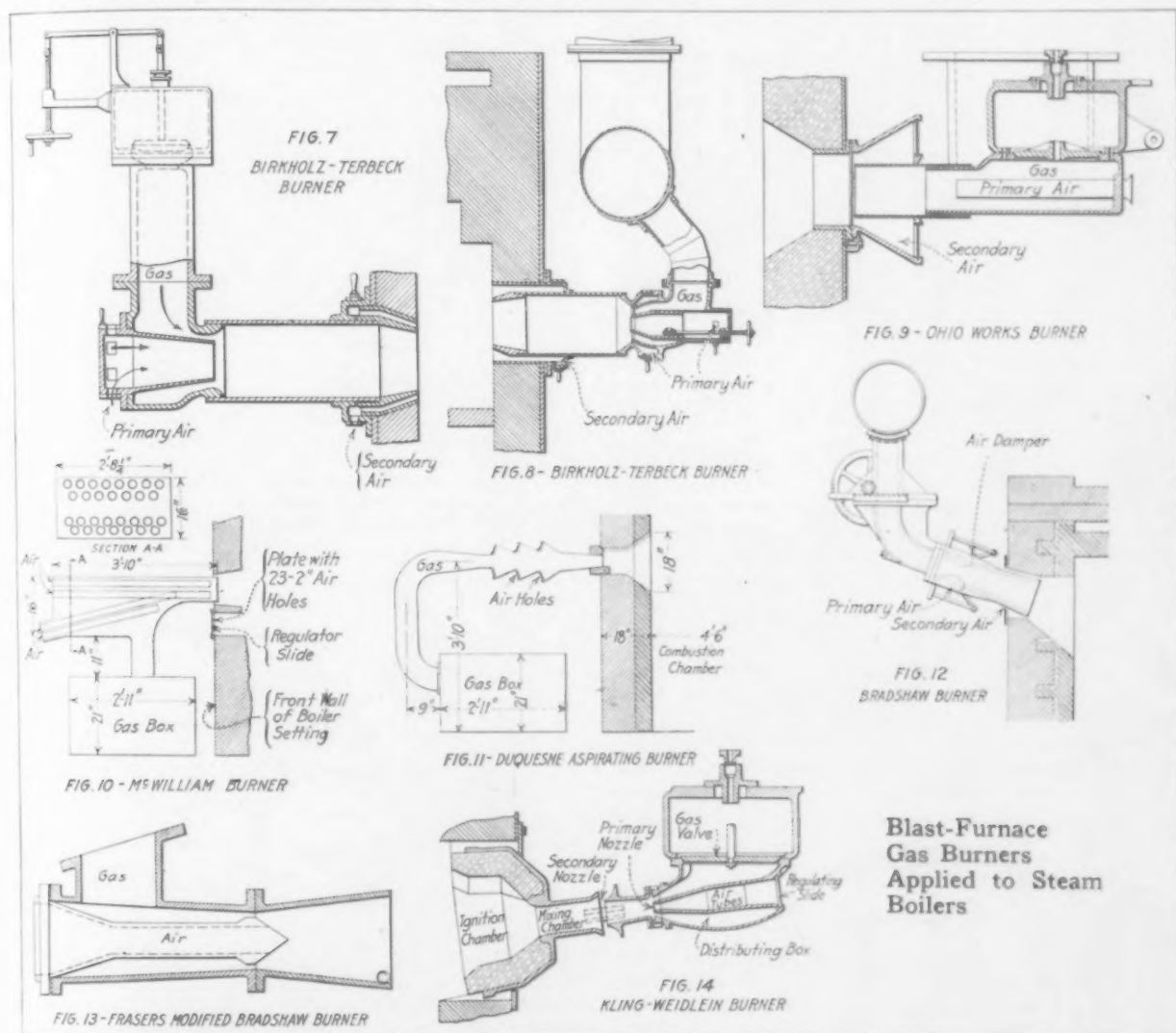
The results showed in part that it is extremely difficult to make reliable adjustments of burners when judging solely by the appearance of the flame. The best combustion is accompanied by slightly smoky ap-

pearance of the flame, as seen through the glass observation windows of the Birkholz burner, rather than by the bluish-white color usually supposed to indicate perfect combustion. Special tests demonstrated that the aspirating effect of a Birkholz burner with three adjustable air inlets could not be depended upon to supply the proper amount of air for combustion under varying conditions of gas supply and stack draft. Manual adjustment by experienced attendants is necessary to accomplish lasting improvement. While the mechanical devices of the Birkholz burner facilitate such adjustment, it will not give uniformly good results if unattended. The usual efficiency of boiler plants over long periods does not exceed 55 per cent, while the tests prove that 60 to 65 per cent efficiency is easily obtainable if close attention is given to the

burner shown in Fig. 9. The combustion is no better than in the common type of burner. Experiments showed that the draft, due to aspirating effect, increases with the gas quantity, but not in direct proportion to it. In a series of six 8-hr. tests with this burner on a 250-hp. Babcock & Wilcox boiler, an efficiency of 49.7 per cent was found to be about the average operating efficiency. Efficiencies ranging from 53.5 per cent to 55 per cent were obtained under the test conditions with the doors fastened tightly and all openings in the setting mudded up, additional air being admitted by moving back the screen around the burners.

BURNERS OF TYPE 3

An aspirating burner of Type 3, made at Duquesne for experimental purposes, is shown in Fig. 11. It



Blast-Furnace Gas Burners Applied to Steam Boilers

physical upkeep of the boiler plant, even without additional expenditure for special types of burners. As high as 70 per cent efficiency may be obtained from ordinary types of boilers equipped with the better class of burners, when given expert attention under favorable operating conditions.

The degree of improvement in performance accompanying the use of improved burners of the Birkholz type evidently will not be so great with boilers of the Rust and Stirling types as with boilers of the single-pass arrangement such as the Cahall and Wheeler.

SPECIAL BURNERS OF TYPE 2

Fig. 9 shows a burner developed at the Ohio Works of the Carnegie Steel Company. A series of tests on two 400-hp. Stirling boilers fired with mixed raw and washed blast furnace gas indicated that the efficiency of this type of burner was about equal to that of the Birkholz burner. The McWilliams burner, shown in Fig. 10, is built on about the same principle as the

consists of a series of air vanes at the top and bottom of the burner, the gas jet being contracted at each vane, but each contracted area being made larger than the preceding one. When operated at the rated capacity of the boiler, 250 hp., a burner efficiency of 92 per cent was obtained, but on increasing the capacity, the efficiency dropped rapidly, due to unconsumed CO. In tests with this burner on a 250-hp. Babcock & Wilcox boiler, a boiler efficiency of 63.7 per cent was obtained. Tests made at the same time on an adjoining boiler using the common type of burner showed a boiler efficiency in the neighborhood of 56 per cent.

The Bradshaw burner shown in Fig. 12 is supposed to follow the principle of the Venturi meter. It consists of a rectangular casting through which the gas passes, air being admitted through narrow openings top and bottom for the full width of the burner. The casting is contracted at this point, and the reduction in pressure due to the increase in velocity provides the medium for air aspiration. The casting then flares out

to permit expansion from the throat of the burner into the furnace. In tests on a 500-hp. Stirling boiler (Fig. 16) at the works of the Pittsburgh Steel Company, Monessen, Pa., the boiler efficiency over the usual working range of gas pressure averaged 65.1 per cent. The test results showed, with an increase of gas above the amount for which the original adjustments of the burner were made, a loss of 8.2 per cent due to unconsumed CO gases, proving that air in proportion was not induced through the burner.

Two modifications of the Bradshaw burner have been made, known as Fraser burners No. 1 and No. 2. The principal difference between these modifications and the Bradshaw burner lies in taking air to the contracted portion of the gas jet inside instead of outside. In burner No. 1 the side gas passages past the air box

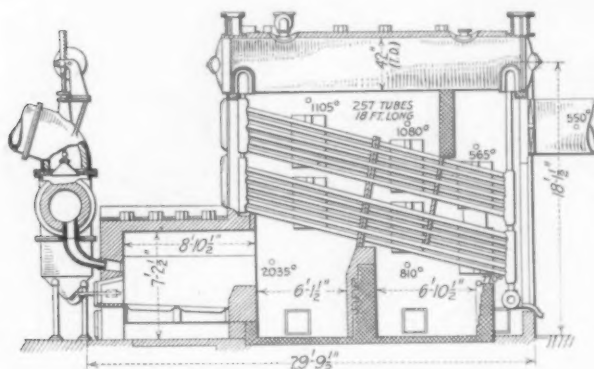


Fig. 15—500-hp. Babcock & Wilcox Boiler at McKeesport Plant of National Tube Company Indicated 72 Per Cent Efficiency with Old Style Burner

were made too small, resulting in only a small amount of gas passing under the air box. Burner No. 2 was designed to provide ample passage for gas on the sides of the air box, which resulted in more nearly equal gas pressures at the top and bottom of the burners. The test of Fraser burner No. 2 showed an average efficiency of 65.4 per cent.

Another burner of the general type of Class 3 is the Kling-Weidlein burner, developed at the Ohio works of the Carnegie Steel Company and illustrated in Fig. 14. The gas leaves the primary nozzle at high speed and in two streams, drawing the primary air in between the gas streams. The air mixes with the inside layers of the gas streams on their way to the ignition

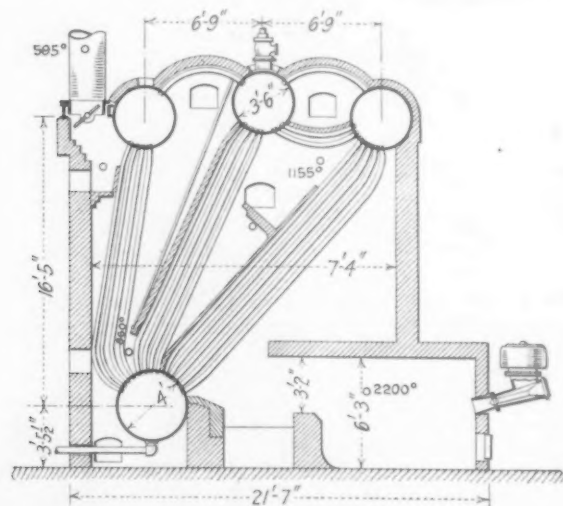


Fig. 16—Gas Burner Installation of 500-hp. Stirling Boiler, Pittsburgh Steel Company, Monessen, Pa.

chamber, but before the latter is reached the secondary air is brought in in two streams and mixes with the outside layers of the gas stream. The results of tests with this burner showed that within small limits of pressure variations, a burner will aspirate practically, though not exactly, the correct quantities of air. For large pressure differences, however, regulation of gas

pressure or air supply would be necessary to the maintenance of maximum efficiency.

BURNERS WITH A POSITIVE AIR SUPPLY

A burner of the type in which all the air is forced into the burner and completely mixed with the gas before the ignition point is shown in Fig. 17. All the air required for combustion is supplied by a motor-driven fan. Air enters the rectangular box at the back of the burner, and after passing through the short pipes, mixes with the gas. Gas and air are thoroughly intermingled before reaching the point of ignition at the end of the burner. By careful regulation a burner efficiency of 96 per cent was obtained. In a working arrangement of forced draft, the speed of the motor or engine driving the fan should be controlled by the gas pressure. Results of a representative test for this burner on a 250-hp. Babcock & Wilcox boiler showed 21.9 per cent of CO₂ in the stack gases, and 3.1 per cent O₂, while CO was zero. The boiler efficiency in this test was 65.6 per cent.

GENERAL CONCLUSIONS REGARDING BOILER PRACTICE

The most noticeable feature in the comparison of boiler tests with relation to the burners is that in the same plant nearly all of the burners compared showed very little difference in efficiency, although there may be considerable difference between particular tests in the same plant. The plant must therefore be considered a constant, and we must conclude that the equipment and supervision is superior in the plant showing the best results. The following general conclusions were drawn as a result of all the tests of burners in connection with boilers:

1. Under test conditions all types of burners appear to approximate equal results with the same equipment and management, although engineering features in some types render manipulation and control easier.
2. High efficiencies will prevail when the equipment is properly designed and in first-class condition.
3. Combustion chambers should be sufficiently large to

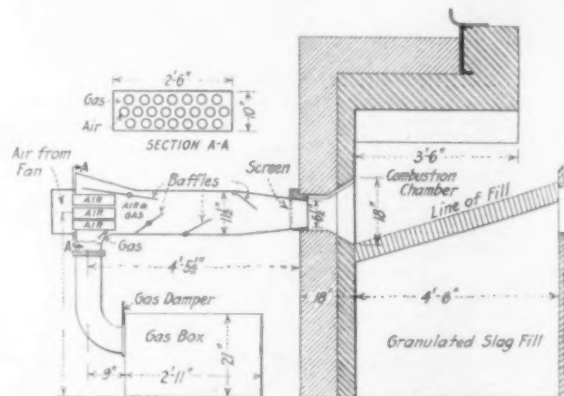


Fig. 17—Positive Air Supply Burner at Duquesne Works

accomplish full combustion of the gas before it passes the first row of boiler tubes. Combustion chambers should be proportioned to suit the burner conditions. In general, the size of combustion chambers should be inversely proportional to the degree of mixing in the burner.

4. Balanced draft control in the combustion chamber and necessary damper regulations with consequent exclusion of infiltrated air is a decided advantage.

5. Although a burner can be designed to aspirate the proper quantity of air at one pressure, none has yet been designed to aspirate over any very considerable range of varying gas pressures. Over small ranges a number of the recently developed burners approach within practical limits the condition of sufficient air supply.

6. Gas pressures constantly varying within relatively wide limits render impossible the attainment of good combustion without constant regulation of the air supply.

7. Unless preheaters, superheaters or economizers are used, claims of boiler efficiencies of over 70 per cent should be accepted with caution.

8. Constant gas analysis coupled with intelligent supervision is one of the principal factors in obtaining continuous high efficiency and control without much change in equipment.

9. A properly designed burner with easy means of controlling air and gas mixtures is far preferable to slipshod methods which prevail in many plants.

IRON-ORE OUTPUT 55,000,000 TONS

Increase of 14,000,000 Tons Last Year Over the 1914 Production

The iron ore mined in the United States in 1915 was 55,526,490 gross tons, the greatest output of any year except 1910 and 1913. The shipments in 1915, 55,493,100 gross tons, valued at \$101,288,984, were a little less than the quantity mined. The quantity mined in 1915 was an increase of 14,000,000 tons over the output in 1914. The increases in quantity and in value of iron ore shipped amounted to about 40 and 41 per cent, respectively. The average value per ton in 1915 was \$1.83, compared with \$1.81 in 1914. These figures were prepared by E. F. Burchard of the U. S. Geological Survey, who states that the production of iron ore from the Lake Superior district alone in 1916 will possibly be 60,000,000 tons.

Iron ore was mined in 27 States in 1914 and 23 in 1915. Three of these States, Idaho, Nevada and Utah, produced small quantities of ore for metallurgical flux only; part of the production from California and Colorado was for smelter flux and part for pig iron and ferroalloys; the remaining States produced iron ore for blast-furnace use only, except small tonnages for paint from Georgia, Michigan, New York, Pennsylvania and Wisconsin. Five States, Minnesota, Michigan, Alabama, Wisconsin and New York, which have in recent years produced the largest quantities of iron ore, occupy in 1915 their accustomed places. Only one of these States, New York, produced less than 1,000,000 tons in 1915.

Iron Ore Mined in the United States in 1914 and 1915, Gross Tons

State	1914	1915
Minnesota	21,946,901	33,464,660
Michigan	10,796,200	12,514,516
Alabama	4,838,959	5,309,354
Wisconsin	886,512	1,095,388
New York	785,377	998,845
Wyoming	366,962	434,513
New Jersey	350,135	415,234
Pennsylvania	406,326	363,309
Virginia	378,520	348,042
Tennessee	330,214	284,185
Georgia	67,722	115,701
North Carolina	57,667	66,453
Missouri	37,554	40,290
New Mexico	81,980	34,806
Colorado	10,464	*
Connecticut	9,149	*
Maryland	6,369	5,500
Nevada	*	3,993
Massachusetts	7,600	3,950
Ohio	5,138	3,455
California	1,282	646
Kentucky	21,400	.....
West Virginia	6,530	.....
Other States†	40,800	23,650
	41,439,761	55,526,490

*Less than three producers in Colorado and Connecticut in 1915 and in Nevada in 1914, and permission was not granted to publish State totals.
†1914: Idaho, Mississippi, Montana, Nevada, and Utah; 1915: Colorado, Connecticut, Idaho and Utah.

The principal iron-mining districts in the United States, except the Adirondack district, are interstate. The Lake Superior district mined nearly 85 per cent of the total ore in 1915 and the Birmingham district about 8.5 per cent, or a little more than one-tenth as much as the Lake district. None of the other districts mined as much as 1,000,000 tons. The increase in production in 1915 was especially marked in the Lake Superior district, where it reached 40 per cent; the Adirondack and Chattanooga districts each showed a large increase, 28 and 25 per cent respectively; the total for a number of widely separated districts, including those in the western States, showed a decrease as compared with 1914.

Iron Ore Mined in the United States, by Mining Districts in 1914 and 1915

District	1914	1915	Percentage of Change in 1915
Lake Superior*	33,540,403	46,944,254	+40
Birmingham	4,282,556	4,748,929	+11
Chattanooga	432,006	539,024	+25
Adirondack	544,724	699,213	+28
Northern New Jersey and south-eastern New York	541,084	644,493	+19
Other districts	2,098,988	1,950,577	-7
	41,439,761	55,526,490	+34

*Includes only those mines in Wisconsin which are in the true Lake Superior district.

The apparent consumption of iron ore, obtained by adding together the shipments of ore from the mines, the sales of zinc residuum, and the imports of iron ore, and deducting from the sum of these the exports of iron ore, was 56,286,058 gross tons in 1915, compared with 40,613,448 gross tons in 1914, an increase of nearly 39 per cent. The ratio of pig iron produced to iron ore consumed was 53.15 per cent in 1915 compared with 57.45 per cent in 1914.

Notable Operation of a Minnesota Blast Furnace

The blast furnace of the Zenith Furnace Company, Duluth, Minn., has been averaging more than 300 tons of iron per day on 1924 lb. of coke, making a merchantable iron running 2.65 per cent silicon, according to a correspondent of the *Engineering and Mining Journal*. The dimensions of the furnace are 16 ft. 6 in. at the bosh, 11 ft. 9 in. in the crucible and 75 ft. high, and there has been no change since it was built 29 years ago by John Birkinbine, except that in 1907 the bosh was dropped 4 ft.; but it has been given air enough and the burden has been changed sufficiently to insure plenty of air with no great waste in flue dust.

A year ago this furnace, working on a burden of 25 per cent old range, non-Bessemer, and 75 per cent Mesaba, non-Bessemer, was producing 204 to 215 tons of foundry pig iron per day and 20 tons of flue dust per day. For five days last December its record was 1982 tons for the week of Dec. 11, using 2000 lb. of coke per ton of iron. A five-day record of operations was as follows:

	Pig Iron, Tons	Coke Per Ton of Iron, Lb.
Dec. 10, 1915	310	1,881
Dec. 11, 1915	289	1,904
Dec. 12, 1915	301	1,928
Dec. 13, 1915	307	1,910
Dec. 14, 1915	305	1,880

At 300 tons a day, the flue dust is about 6 tons or more than 50 per cent less than formerly. The burden now is 75 per cent, Section 30, non-Bessemer (Vermillion hard ore) and 25 per cent Mesaba. The former ore is very high in silica, 9 to 10 per cent, and it was freely predicted that the furnace could never take care of the slag when using a large proportion of this ore.

By a change in metallurgical practice, the pig-iron output has not only been largely increased but the flue-dust losses have been greatly decreased, both without appreciable increased coke consumption. Run-of-oven Otto Hoffman by-product coke, not prepared coke, is being used and there is no Gayley dry blast.

Water in Coal

"Some Properties of the Water in Coal," by Horace C. Porter and O. C. Ralston, is the title of Technical Paper 113, issued by the U. S. Bureau of Mines. It deals with the manner in which water may be held in coal and how its properties and those of coal are affected by the condition in which it is held. The Bureau has analyzed many thousands of samples of coal from different coal fields and has studied the behavior of coal under the varied conditions which attend its use. The question of its water content is considered of importance in connection with the destructive distillation, the alterations during storage and other phases of the industrial utilization of coal.

Tungsten and Antimony from Bolivia

Exports of metals from Bolivia in the last two years have been as follows:

	1914, Tons	1915, Tons
Tungsten	276	499
Antimony	186	13,085
Copper	3,874	17,872
Tin	37,259	39,312
Bismuth	437	568

Bolivia and Peru have been growing in importance as sources of tungsten since the war started. The expansion in antimony and copper in Bolivia, due to the war, is also striking.

SHEET ANNEALING FURNACES

Selective System of Control of Combustion at Plant of Standard Tinplate Company

The extension of the mill of the Standard Tinplate Company, Canonsburg, Pa., made necessary the removal of the annealing furnaces which had been doing service, and paved the way for the installation of a new battery of nine ovens in the design of which improvements in heat distribution and combustion control of an interesting nature are embodied. The former furnaces were of a type common to sheet mills in the Pittsburgh district. They

A characteristic of gas not possessed by other fuels is that it may be burned in small amounts, making it possible to locate burners to insure the required heat distribution. Accordingly, each annealing furnace is provided with a total of 69 burners, arranged 20 on each side and 29 down the middle. Each side has a separate manifold which, like the center manifold also, may be controlled independently of the others, while a master valve regulates the entire furnace. The burners are brought in through the sides of the ovens and up through the floor for the entire length. Each side burner has an individual valve which permits regulation to control the longitudinal distribution of heat. The natural circulation with the furnace being upward

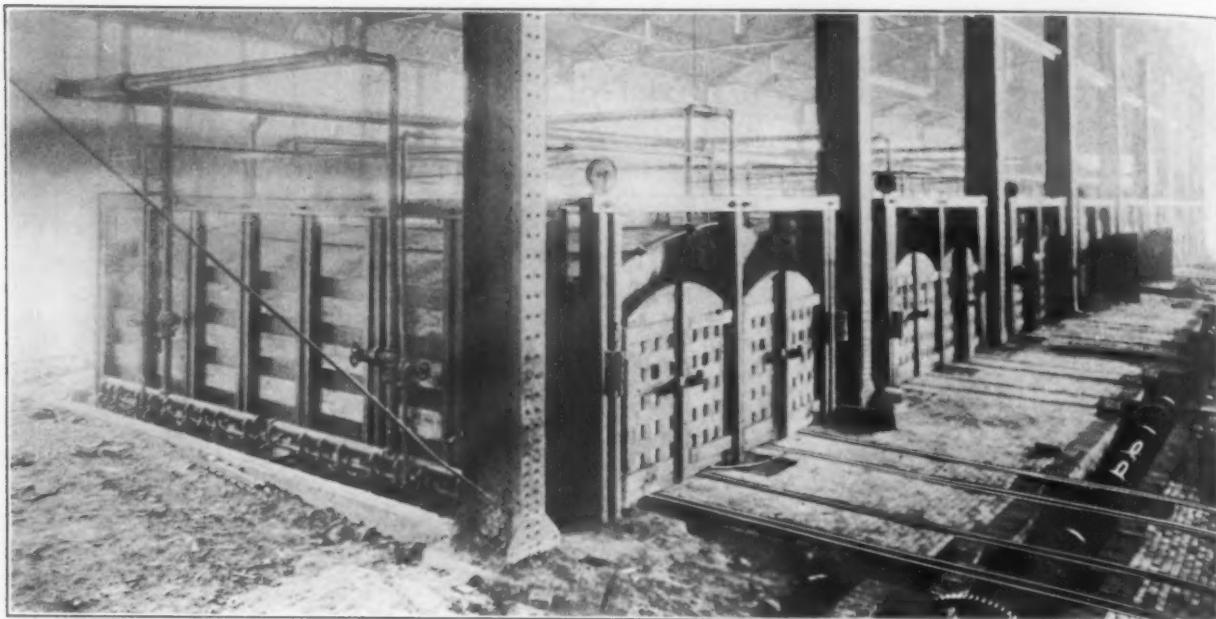


Fig. 1—Sheet Annealing Furnaces of the Standard Tinplate Company, Canonsburg, Pa.

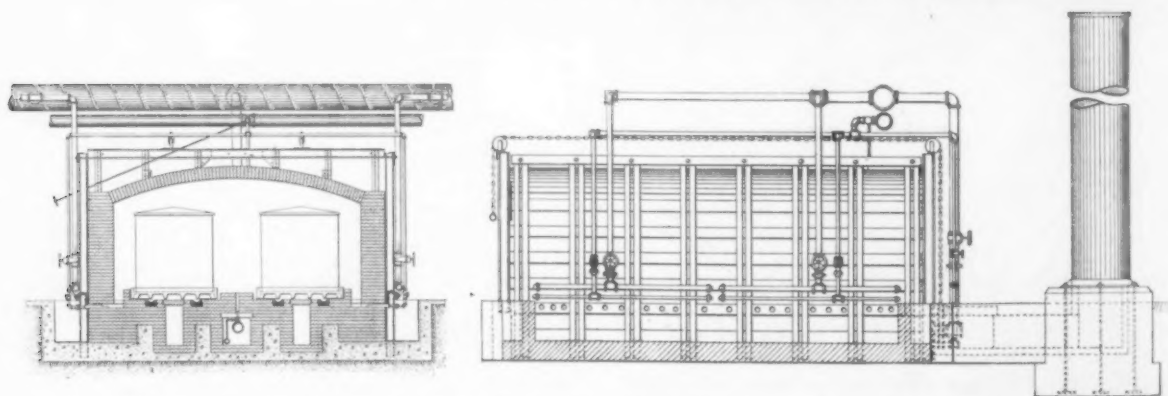


Fig. 2—Section and Elevation of the Flinn & Dreffin Annealing Furnace

were built in pairs, each oven accommodating eight pots or sixteen to the pair. The fuel, natural gas, was introduced through and burned in three Dutch-oven combustion chambers at the sides, each chamber having two gas burners. Natural draft supplied the air for combustion, and an elaborate damper system was the means of heat distribution.

The new battery of annealing ovens feature a complete air and burner system, and an attention in the design of the oven toward effecting a complete circulation within the oven. The ovens are 15 ft. wide by 24 ft. deep inside, and will take care of ten pots in each oven, the gross weight of pot and metal being about 13,000 lb. or about 65 tons of metal per charge per furnace. The furnaces are exceptionally heavy construction and each has two charging tracks.

at the sides and downward in the middle, the central row of burners serves to neutralize this circulation, balancing the heat over each row of pots. Thus the waste gases are drawn out through two stack flues, one central with each charging track.

The maintenance of the proper excess of gas in the combustion mixture to insure a continuous reducing atmosphere within the heating chamber of the oven, and at the same time avoiding the excess which is derogatory to combustion efficiency, calls for a close regulation. In this installation air and gas gages have been used which, being set in the proper relation one to the other, determine and fix the valve control to give the required proportions of air and gas for combustion, while still maintaining a reducing atmosphere. This manner of regulation not only holds good for normal operating con-

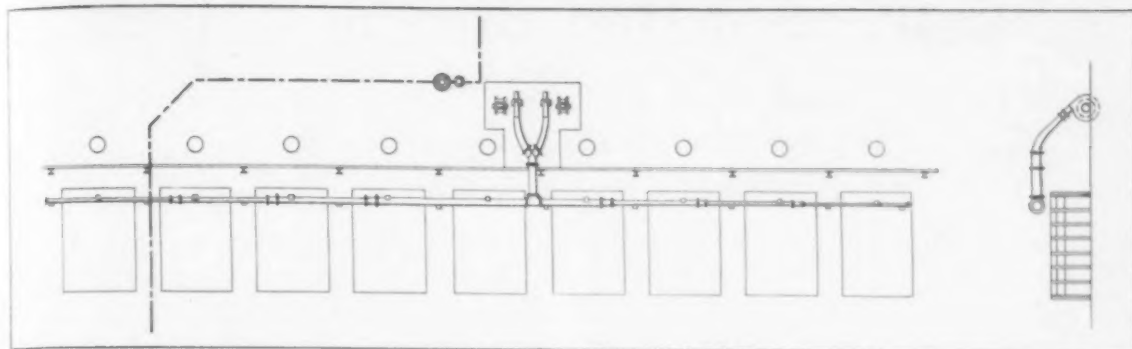


Fig. 3—Plan of the Standard Tinplate Company's Annealing Furnace Plant

ditions, but also insures a uniform mixture when the furnace is forced or when a slow application of heat is desired. As may be seen from Fig. 2, the master valve for each furnace is provided with an extension stem, so that it as well as the gas and air valves can be conveniently regulated from a position in front of the operating gages.

In the operation of these furnaces the evidence of economy is found naturally in the fuel consumption, the amount of gas required per pot per anneal. A test meter was connected to one of the former annealing furnaces, and over an extended period of operation the gas consumption per pot per anneal was found to be 7630 cu. ft. The corresponding determination under the conditions of operating the new battery was 5300 cu. ft. of gas, or a fuel saving of 30 per cent. Deducting from this saving the cost of forced draft as against the natural draft of the old furnaces, 50 hp.-hr. of electric current consumption being required per anneal of 12 hr. for a furnace operating under full load, it is figured that a net fuel saving of 28.6 per cent has been secured.

The motor-driven blower set, which is installed in duplicate to avoid the possibility of interrupted operations, is shown among the illustrations, and consists of a Sirocco blower of special design, built by the American Blower Company, direct connected through a flexible coupling to a General Electric alternating-current motor. The relation of the blowers to the furnaces is shown in the general diagram. With this positive air system the burners, which are of special design, providing for a constant air flow under constant air pressure, once adjusted, are counted on to yield an indefinite repetition of oven heats with absolute precision. The entire installation was designed and its construction supervised by the Flinn & Dreffein Company, engineer and manufacturer, Chicago.

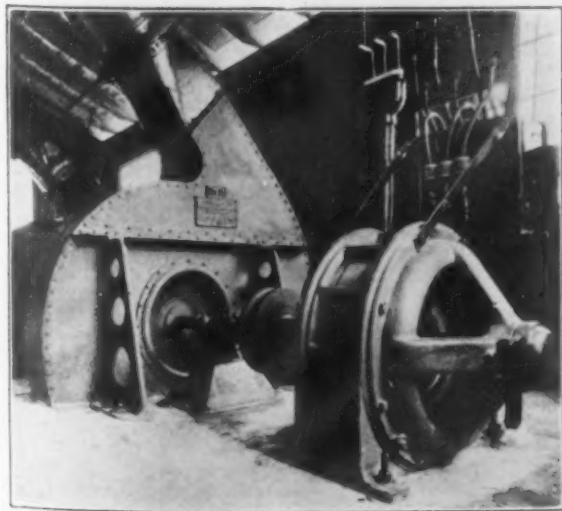


Fig. 4—The Blowers Are in Duplicate

Germany's Iron and Steel Output at New War Records

Germany's steel and pig-iron outputs continue to expand. The steel ingot outputs for February and March were 1,236,845 and 1,361,365 metric tons respectively, against 1,227,120 tons in January. The daily output was 49,473 tons in February and 50,421 tons in March; in March, 1915, it was 40,677 tons. The steel production in March, 1914, before the war, was 1,634,297 tons or 62,857 tons per day, so that the present rate is 80 per cent of the ante-war output. The following table shows the grades of steel made in February and March this year, in metric tons:

	February, 1916	March, 1916
Bessemer steel	602,543	664,730
Open-hearth steel	535,113	584,920
Steel castings	76,774	85,850
Crucible steel	8,564	9,773
Electric steel	13,851	16,092
Total	1,236,845	1,361,365

The March production of electric steel, 16,092 tons, exceeds all records.

The German pig-iron output for March was 1,114,194 metric tons, the largest since the war started, as compared with 1,036,683 tons in February, then the war record. The daily output was 35,942 tons, also the war record. The output in March, 1915, was 938,438 tons or 30,272 tons per day. The March production this year was made up of 161,556 tons of foundry iron, 16,965 tons of Bessemer iron, 713,691 tons of Thomas or basic iron, 202,134 tons of steel-making iron and spiegeleisen and 19,848 tons of forge or puddle iron. The output for the first quarter was 3,229,245 tons, against 2,616,194 tons to April 1, 1915. Press reports place the April output at 1,073,706 tons.

These statistics are those of the Association of German Iron and Steel Manufacturers and taken from British papers. They could not be verified by those printed by *Stahl und Eisen* because of the non-arrival of German trade papers. British reports usually agree with the German, however.

Manganese Exports from India Larger

Manganese ore exports from British India in February, 1916, were 56,302 gross tons, of which 38,152 tons went to Great Britain. The exports in February, 1915, were only 17,316 tons. For the 11 months of the fiscal year ended Feb. 29, 1916, the total Indian exports were 444,289 tons, of which 358,794 tons went to Great Britain, against 424,459 tons in the corresponding previous 11 months when the British consignments were 214,154 tons.

By arranging channels in the crowns of the ends of open-hearth furnaces and connecting them with a compressed-air conduit, Regnier Eickworth of Dortmund, Germany, in a patent (U. S., 1,176,744, March 28, 1916) claims to prolong the life of a furnace by passing air through the channels so as to cool the crown and also exercising a cooling effect on the exhaust channels. The system is applied to both ends of the furnace, connected to a common compressed-air line with a reversing valve at the junction.

April Exports of Iron, Steel and Machinery

Values of Iron and Steel Exports Break All Records, but Quantity Falls Off—Machinery Exports Reach New High Mark

WASHINGTON, D. C., June 6, 1916.—Exports of iron and steel products by values broke all previous monthly records in April, 1916; shipments of machinery and of machine tools established new high marks, but a slight decline in exports of tonnage commodities was recorded, according to figures compiled by the Bureau of Foreign and Domestic Commerce. The unprecedented totals reached on a basis of values would have been much more impressive and that of tonnage commodities would have closely approximated the record but for the fact that April embraced but 25 official working days, while March, the banner month to date, included 27. Total shipments of iron and steel products on a basis of value gained 190 per cent over those of April, 1915, and a fraction of 1 per cent over the record total of March, 1916. Tonnage commodities in April gained 74 per cent over the same month of 1915, but declined 12 per cent as compared with the high mark of March, 1916. Shipments of machinery in April gained 75 per cent over the same month of 1915 and 8 per cent over the record total of March, 1916. Exports of machine tools in April exceeded by nearly 100 per cent those of the same month of 1915 and gained a fraction of 1 per cent over the high record of March, 1916.

For the ten months the total exports of iron and steel products gained nearly 200 per cent over the corresponding period of 1915 and nearly 100 per cent over the record total of 1913. Tonnage commodities for the ten months of 1916 exceeded by nearly 200 per cent the total for the same period of 1915 and by 110 per cent the record figures of 1914. Shipments of machinery for the ten months of 1916 gained nearly 100 per cent over 1915 and 30 per cent over the high record of 1913. Exports of machine tools for the ten months of 1916 exceeded by 108 per cent those of the corresponding period of 1915, when high water mark was reached.

EXPORTS OF IRON AND STEEL

The value of all shipments of iron and steel products in April, 1916, was \$58,722,411, as compared with \$20,639,569 for the same month of 1915, while for the ten months of 1916 the total was \$472,133,773, as compared with \$167,594,643 for the same period of 1915 and \$252,-

658,481 in 1913, the record total for the first ten months of the fiscal year.

The exports of iron and steel for which quantities are given aggregated 384,920 gross tons in April, 1916, as compared with 223,242 tons for the same month of 1915 and 161,952 tons in April, 1914. The record for such exports was made in March, 1916, with a total of 438,150 tons. The total for the ten months ended April was 3,787,030 gross tons as compared with 1,385,362 tons for the same period of 1915 and 1,800,224 tons for the ten months of 1914.

The following table shows the exports of tonnage iron and steel in April and for the ten months ended April, 1916, as compared with 1915:

	April		Ten Months	
	1915, Gross Tons	1916, Gross Tons	1915, Gross Tons	1916, Gross Tons
Pig iron	16,182	18,518	89,902	209,336
Scrap	6,805	15,975	21,500	113,953
Bar iron	3,054	5,201	7,678	57,099
Wire rods	14,968	14,555	69,067	137,799
Steel bars	20,229	58,215	139,110	486,452
Billets, ingots and blooms, n.e.s.	41,321	88,764	123,026	703,021
Bolts and nuts	1,322	2,265	10,747	26,194
Hoops and bands	1,826	2,671	11,501	33,969
Horseshoes	1,781	695	9,196	10,706
Cut nails	421	174	1,852	3,434
Railroad spikes	250	3,057	4,618	22,347
Wire nails	5,044	10,884	38,832	99,370
All other nails, including tacks	487	634	3,463	7,822
Cast pipes and fittings	4,815	4,928	50,940	42,129
Wrought pipes and fittings	11,440	7,495	86,844	101,066
Radiators and cast-iron house heating boilers	161	123	2,319	1,972
Steel rails	10,991	22,346	105,394	443,197
Galvanized iron sheets and plates	7,844	5,484	37,551	61,960
All other iron sheets and plates	958	3,262	6,938	33,344
Steel plates	11,910	21,066	85,748	229,939
Steel sheets	6,083	9,128	77,222	78,812
Structural iron and steel	12,564	19,999	131,540	221,894
Tin and terne plates	9,084	21,384	65,210	175,137
Barb wire	16,721	27,689	105,283	287,548
All other wire	16,981	20,408	99,881	198,520
Total	223,242	384,920	1,385,362	3,787,030

MACHINERY EXPORTS

Exports of machinery in April, 1916, were valued at

	April		Ten Months	
	1915	1916	1915	1916
Adding machines	\$32,715	\$160,540	\$379,369	\$818,211
Air-compressing machinery	32,668	35,813	308,588	437,883
Brewers' machinery	5,862	95	99,061	20,946
Cash registers	86,210	201,350	1,132,051	1,158,813
Parts of	7,641	10,183	90,075	102,601
Cotton gins	2,251	1,749	35,005	59,786
Cream separators	28,880	49,023	155,811	407,222
Elevators and elevator machinery	70,549	150,232	685,771	1,245,999
Electric locomotives .....	.....	26,964	249,096	422,340
Gas engines, stationary	41,234	45,767	370,795	290,287
Gasoline engines	479,817	1,575,634	3,538,966	8,264,973
Steam engines	286,461	1,123,731	2,156,838	12,765,079
All other engines	135,415	449,321	658,174	2,198,116
Parts of	375,967	656,713	2,207,138	5,529,653
Laundry machinery, power	42,851	15,233	231,801	230,920
All other	17,262	18,061	184,581	224,362
Lawn mowers	39,382	15,775	243,118	153,239
Metal-working machinery (including metal-working tools)	3,300,953	6,552,397	20,664,839	42,913,241
Meters, gas and water	24,756	27,050	254,910	219,818
Milling machinery (flour and grist)	296,912	99,844	1,000,376	2,048,292
Mining machinery, oil well	103,625	64,901	1,761,530	908,229
All other	470,321	480,035	3,570,470	5,247,367
Paper-mill machinery	79,120	60,813	607,011	764,001
Printing presses	105,207	150,804	1,152,179	1,241,019
Pumps and pumping machinery	203,862	413,667	2,008,784	3,612,643
Refrigerating and ice-making machinery	163,947	47,034	502,723	557,531
Sewing machines	518,529	376,077	5,089,533	4,461,271
Shoe machinery	144,950	101,612	1,980,758	1,115,860
Sugar-mill machinery	199,401	180,490	1,784,194	5,451,814
Textile machinery	113,844	378,786	1,242,988	2,101,392
Typesetting machines	46,099	76,292	630,697	587,639
Typewriting machines	566,175	726,170	3,982,913	7,021,721
Windmills	68,685	170,939	565,285	895,109
Wood-working machinery, saw-mill	28,597	32,387	202,912	295,213
All other	83,370	63,481	526,470	946,473
All other machinery, and parts of	2,196,198	2,987,936	14,127,841	25,431,902
Total	\$10,399,716	\$17,526,899	\$73,382,651	\$140,150,965

\$17,526,899, as compared with \$10,399,716 for the same month of 1915 and \$9,757,471 in April, 1914. Shipments of metal-working machinery, which scored a big increase in March, slightly exceeded the total of that month. Exports of machinery of all kinds for the ten months ended April, 1916, were valued at \$140,150,956, as compared with \$73,382,651 for the corresponding period of 1915.

Details of the exports of machinery for April, 1915 and 1916, and for the two ten months' periods are given in the accompanying table.

IMPORTS OF IRON AND STEEL

Imports of tonnage iron and steel in April amounted to 20,028 gross tons, as compared with 16,569 tons in the same month of 1915, which was a substantial increase, but a heavy decline is shown as compared with several months of the current fiscal year. The total for the ten months ended April, 1916, was 250,571 tons, as against 190,140 tons for the same period of 1915.

The following table shows the imports of tonnage commodities for April and for the ten months ended April, 1916, as compared with 1915:

	April		Ten Months	
	1915, Gross Tons	1916, Gross Tons	1915, Gross Tons	1916, Gross Tons
Ferrosilicon	705	754	5,629	4,516
All other pig iron.....	2,373	7,926	83,044	89,708
Scrap	2,310	6,116	27,613	85,737
Bar iron	270	756	9,387	6,127
Structural iron and steel...	148	139	5,507	1,238
Hoop or band iron.....	...	...	648	470
Steel billets without alloys.	617	1,357	1,572	8,447
All other steel billets.....	738	1,259	21,247	8,459
Steel rails	8,921	483	24,612	40,037
Sheets and plates.....	59	157	2,376	1,467
Tin andterne plates.....	44	179	4,652	673
Wire rods	382	302	3,853	3,692
Total	16,569	20,028	190,140	250,571

Advance reports of exports for the month of May from all ports except New York show substantial gains in shipments of iron and steel, and indicate that the month will break all records unless adversely affected by freight congestion at New York.

W. L. C.

INTERNATIONAL HARVESTER

Report Shows Unexpectedly Large Profits— Comment on Foreign Conditions

The annual report of the International Harvester Company of New Jersey and the International Harvester Corporation for the fiscal year ended Dec. 31, 1915, has been issued. The more striking comparisons with the report of the preceding year have to do with decreased inventories both at home and abroad, largely increased cash assets and the surprisingly favorable earnings, concerning each of which the comment of President Cyrus H. McCormick is of general interest.

PRESIDENT'S STATEMENT

In discussing the year for the International Harvester Company of New Jersey, President McCormick says:

"Notwithstanding the bountiful crops and the high prices received by the farmer, implement dealers, as a rule, pursued a policy of conservatism in ordering their stocks.

"The inventories of raw materials, work in progress, and finished products at the close of 1915 were \$9,400,000 less than at the close of the preceding year. This decrease, coupled with satisfactory collections and a smaller manufacturing output, due to inability to maintain the volume of our export trade, resulted in largely increased cash balances.

"The difficulties incident to export trade have materially curtailed the volume of foreign shipments, and the consequent reduction in output made it necessary to operate the plants with smaller forces and on shorter hours. The increase in the cost of materials and labor entering into the manufacture of the company's products for the year 1916 necessitated an increase in the

selling prices of nearly the entire line. Owing to some favorable material contracts, the full effect of these increases in manufacturing costs will not be felt until production for the season 1917 begins. An additional increase in the prices of our products for 1917 will be necessary to meet this increased cost of manufacture."

CONDITIONS AT FOREIGN FACTORIES

The following are excerpts from the International Harvester Corporation's report:

The implement works at Neuss, Germany, and Lubertzy, Russia, have been in operation during the year, but with reduced forces and subject to delays owing to the difficulty in securing adequate quantities of materials and supplies. The works at Norrköping, Sweden, have been running at full capacity, except for temporary delays and interruptions due to the material situation. The works at Croix, France, have not been in operation since August, 1914. No report of any damage to this property has been received. Collections in all European countries have, under the circumstances, been remarkably good.

No capital expenditures of moment were made at the foreign works, with the exception of Norrköping, Sweden, where a new forge building was erected and the new twine mill completed.

FINANCIAL STATEMENTS

The financial statements of the two companies for the years ended Dec. 31, 1914 and 1915, including income accounts, follow. That of the International Harvester Company of New Jersey shows:

	1915	1914
Income from operation.....	\$14,186,622	\$12,206,227
Interest, depreciation, etc.....	5,610,187	4,742,996
Net profit for 1915.....	\$8,576,435	\$7,463,231
Net surplus	\$27,448,464	\$22,972,029

Some of the items included in the balance sheet are:

Assets		
Inventories	\$25,977,503	\$35,402,598
Receivables, less reserves for losses..	28,831,370	42,589,510
Cash	34,214,343	8,145,296
Liabilities		
Bills payable	\$17,891,280	\$21,743,300
Current invoices, pay rolls, interest, and taxes accrued, etc.....	5,665,678	6,944,753

The income account of the International Harvester Corporation shows:

	1915	1914
Income from operations.....	\$6,608,466	\$7,329,826
Interest, depreciation, etc.....	2,888,324	3,067,231
Net profits	\$3,720,141	\$4,262,595

In the balance sheet are shown:

Assets		
Inventories	\$24,238,076	\$34,860,627
Receivables, less reserves for losses..	41,981,208	54,888,236
Funds accumulated and retained in Europe owing to unfavorable ex- change rates	28,041,068	...
Cash	2,555,974	*13,099,878

*Of this amount \$8,000,000 was in bank balances abroad.

Liabilities		
Bills payable	\$15,000,000	\$15,389,280
Current invoices, pay rolls, interest, and taxes accrued, etc.....	6,981,526	15,000,000

The Municipal Civil Service Commission, New York City, will receive applications for the position of inspector of light and power until June 19. The duties of the position are to inspect and report on electrical repairs and supplies and on the proper installation, operation and maintenance of electrical equipment to insure compliance with the provisions of the electrical code or contract specifications and to inspect and pass upon the lighting of street and public buildings as to general illumination and economical efficiency. Candidates must be at least 21 years of age, citizens of the United States and residents of the State of New York. They must have had at least two years' experience as a wireman or two years' operating experience in an electric generating plant or two years' testing experience in the shops of an electric manufacturing company, or the equivalent.

ESTABLISHED 1855

THE IRON AGE

EDITORS:

GEO. W. COPE

A. I. FINDLEY

W. W. MACON

CHARLES S. BAUR, *Advertising Manager*

Published Every Thursday by the DAVID WILLIAMS CO., 239 West Thirty-ninth Street, New York

W. H. Taylor, *Pres. and Treas.*

Charles G. Phillips, *Vice-Pres.*

Fritz J. Frank, *Secretary*

M. C. Robbins, *Gen. Mgr.*

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: Park Building. Boston: Equitable Building. Philadelphia: Real Estate Trust Building. Cleveland: New England Building. Cincinnati: Mercantile Library Building.

Subscription Price: United States and Mexico, \$5.00 per year; single copy, 20 cents; to Canada, \$7.50 per year; to other foreign countries, \$10.00 per year. Entered at the New York Post Office as Second-class Mail Matter.

Steel Production After the War

The resumption of new construction in the steel industry began about the middle of last year, and its beginning was on a very modest scale. The United States Steel Corporation started to rush work on its Minnesota steel plant; but the plant itself had been planned many years before and construction work had been in progress for several years. A few of the independents began adding an open-hearth furnace, here and there, and the construction of one new blast furnace was undertaken.

Thus the inception of the present new construction movement occurred scarcely a year ago. Month by month the program has been enlarged, until the announcement two or three months ago that the United States Steel Corporation would build a complete Bessemer steel plant with an annual capacity of 600,000 tons of ingots aroused only a ripple of interest; and last week's announcement that an independent interest would build a Bessemer plant nearly as large has received scarcely passing notice. Yet these two plants alone will have a capacity equal to one-tenth the actual production in the two years preceding the formation of the United States Steel Corporation, a time not so very far removed.

The new construction recently completed or undertaken represents an increase in our steel ingot capacity well in excess of 5,000,000 tons a year. That is not much, in the long run, considering the hiatus in 1914 and 1915. In view of the fact that next year will be well advanced before all the construction work is completed it may be concluded that the new construction does not more than continue the average pace maintained prior to 1913, and in normal conditions such an expansion would be regarded as a matter of course.

These are not normal conditions by any means, however. In some respects the world is set back by the war. Some observers have concluded that in the matter of public conscience the world is set back by a matter of some two or three centuries. As to whether the world is set back in the matter of its demand for steel there is room for argument. That the world will desire to use much more steel than ever is quite clear. There will be a renewed desire to expand, to build up, to cultivate. There is no question as to what will be desired, the ques-

tion being whether the world will be able to do what it wishes to do, and that depends largely upon the issue of the war. It is not simply whether the war will be a draw or will be won by one side or the other; for even if there is a victorious side that side may be exhausted, and the vanquished of course still more so.

If one is willing to admit that the world's demand for steel will be greater after the war than before, either by reason of natural progress in the arts of adapting and consuming steel, by reason of destruction of property that must be rehabilitated, or by the war having the effect of giving industry a fresh impetus, a large expansion in the steel making capacity of the United States is altogether fitting at this time. The belligerents, all of them steel producers, have had little opportunity or desire to increase their steel making facilities. Something has been done, chiefly by way of rounding out various propositions, but there has been no increase that is to be considered besides that which is occurring in the United States. If any of the belligerent countries needed more steel for war, its course was to take the steel and deny it to industries other than that of fighting. The diversion may easily amount to one-half of the total steel making capacity abroad. At the close of the war the steel works will be there, manned as they are at present, providing at one stroke steel making capacity between 10,000,000 and 20,000,000 tons a year—there is no means of making a close estimate—now devoted to the manufacture of war steel.

The extent to which the belligerent countries will be prostrated, and the powers they may develop for recuperation, will determine where the steel that can be made from this released capacity will find a market. A country undertaking to recuperate will not do so by building more steel works. If it has energy it will devote that energy to consuming steel. If it has little energy it will undertake to supply the steel, at whatever prices it will bring, to the neutral countries, even to the United States. If it has much energy it will proceed to consume the steel it can make, and it may even call upon the United States for steel. One thing is certain, that the steel will be produced, for the works have been conserved and the men have been kept at work, as one of the most essential of war measures.

It is evident that the steel manufacturers of the United States expect a large demand for their steel

after the war, or they would not be engaged in increasing capacity as they are. There would be no occasion to build any additional plant if the new capacity could be used only during the war; for if bad times were to come after the war it would be better to let some domestic consumers wait now, thereby perhaps mitigating the bad times. No works built at present high costs could pay for itself in any short period of time.

During the next few months a great deal will be said about the tariff. It is to be hoped that the discussion will proceed with some measure of intelligence; that it will be realized that what the country needs is not a stone wall, with no specification except that it be high enough, but that it needs what it has never had, a scientific tariff, and not only one that is scientific in its construction but one that can be modified promptly as exigencies arise. It seems to be fairly well established that there is to be a tariff commission, whichever party is in power, and what the country needs next is Congressmen committed not simply to a tariff, but to a scientific tariff, one that will keep out steel that we can make ourselves and will make an entrance elsewhere for our steel.

A New Machine Tool Evolution

The machine tool is passing through an interesting and important evolution, much of the results of which will not be felt by the general market until after the close of the present great rush of business. The standard types have been changed very little in the past two years. In fact, their development has been actually retarded. The designers have had to put them to one side in the engrossing, feverish effort to meet the demands that came with the war orders—a demand that brooked no delay and in which price did not figure. Some progress has been made, to be sure, with the regular lines of lathes, planers, milling machines, shapers, drilling machines and the others, but the development has been below normal, especially below the normal of a time of flush business. The concentration has been on special machines, which are either modifications of the standard design or constitute really new types. Both will have an important bearing upon the future, in accelerating the advance of machine shop practice.

Radical departures have been brought forth in the drafting rooms of the machine tool builders, and embodied in machinery which is being used for the manufacture, both here and abroad, of munitions of war for foreign governments. Now that the designers have been relieved to a great extent of the strain to which they have been put, they are studying the products of their shops and the needs of the users with the purpose of applying what they have learned to standard machinery. The results in not a few cases will be important.

Some machines created for a highly specialized work will be established as regular products of their builders. Modifications will be made, perhaps, and sizes added to cover all the work for which the machines may be used to advantage. The manufacturers are saying very little about these proposed innovations. They are too busy to bring

out new machinery now, and until a line is ready to market the maxim is, the least said the better.

For illustration, a metal turning machine, limited in its present use to a special purpose, will later be offered the general trade and doubtless will have an important range of service within certain limits. A milling machine which thus far has been devoted wholly to a narrow sphere of work will be marketed as a full line. A single-purpose lathe will be made a standard, in various sizes. And so it goes—an accentuation, in fact, of the tendency in recent years to replace general utility machines with those more or less special, in order to produce more economically work that goes through in large volume. This used to be more often the case in shops manufacturing such products as typewriters than in the machine shop proper. A machine in which a wide range of usefulness has been made secondary to maximum production is often a profitable investment, and the importance of this way of reducing costs is more and more realized.

The past year has shown a good many owners that they have been slow to take advantage of the opportunities afforded by modern machinery. The average manufacturer is trying to catch up, but finds it difficult to get the required tools. He will be prepared to take hold of the new classes and models when they become available. If business then should be not so brisk, enterprising managers will find that all the greater reason for decreasing costs. They certainly will not feel poor, after the present period of highly profitable business, and they have already condemned to banishment a vast amount of the metal-cutting machinery now in use.

The Fixed Resale Price

Many effective arguments in favor of legislation permitting manufacturers to fix the prices at which their products may be sold at wholesale and retail were presented at hearings on the so-called Stevens bill before the House Committee on Interstate and Foreign Commerce at Washington in the past week. The hearings followed closely the referendum of the Chamber of Commerce of the United States, in which the maintenance of resale prices was advocated by a vote of three to one.

In sharp contradiction of the assertion of its opponents that champions of the Stevens bill are confined to a relatively small number of manufacturers of trade-marked goods, nearly all the witnesses before the House committee represented national organizations of retailers or consumers. The argument that has carried the strongest appeal to Congressmen is put forward from the consumer's standpoint and deals with the protection enjoyed by the consumer in the ability to purchase identified merchandise in any market. The assurance to the consumer guaranteed by the well-known brand is worth more, it was contended at the hearings, than the doubtful temporary advantage of the cut price; hence the argument that Congress in permitting the manufacturer to protect the prices of his trade-marked goods is legislating as much in the interest of the consumer as of the producer.

Prof. Paul H. Nystrom, formerly a professor of economics in the University of Minnesota and the University of Wisconsin, and at present engaged in

trade research work in New York, spoke not only as a student of applied economics but as a practical retailer of many years' experience. The price maintenance principle, he held, is a necessity of modern business and should commend itself to Congress not only for the benefit it would confer upon the producer and distributor, but especially because of the protection it would afford to consumers. The principle embodied in the Stevens bill, he declared, would "reduce trade friction and waste, reduce the cost of distributing goods, equalize the conditions of competition between large and small dealers, affect no business adversely except such concerns as use cut prices on standard, well-known goods as bait to attract trade to their stores, and prove beneficial to the great majority of the people." Further, he said:

Every price-cutting transaction where branded, standard, well-known goods are concerned results in trade friction. The consequent cost must ultimately be paid by the consumer. If the consumer were only wise enough to limit his purchases to the goods that are cut in price for the purpose of drawing trade and did not buy other goods on which a large profit was made, the price-cutting dealer would soon go out of business. The purpose of price cutting would thus prove a failure. This predatory price cutting causes the regular or non-price-cutting dealers of the community to throw out of their stores the articles on which the price has been cut, and finally the price cutter quits handling the article, because it no longer has the power to draw trade, and the consumer is then deprived of all opportunity to procure it.

The hearings brought out the various methods employed by large concerns to protect their prices through the establishment of exclusive agencies, chain stores, etc. In this manner, it was shown, wealthy manufacturers of automobiles, machinery and other articles are able to nullify the decisions of the United States Supreme Court, which hold that under the existing law the producer has no right to fix the resale price of his product. In practical result, therefore, the decisions of the Supreme Court do not prohibit the price maintenance principle; they simply prohibit price maintenance along the lines most economical from the standpoint of producers, dealers and the public. The court in effect has said: "If you want to maintain prices you may not do so by the easiest means. You must use more expensive methods. If the more expensive and more complicated methods are beyond your reach, there is no help for you."

It is not so many years ago that something like a decree went out from a high source at Washington, that "old-fashioned competition" was to be restored in the United States. There is something significant in the wide extent of the present propaganda in favor of the legalizing of price fixing, and the favorable response it has had. Appreciation is growing of the fact that there is no cleavage of the people by which producers and merchants are lined up on one side and consumers on the other. The movement represented by the Stevens bill recognizes that price demoralization must be paid for by the consumer in the end, since the cut price means somewhere the sale of unstandardized or low-standard products at exorbitant prices. Over against it, in whatever form disguised, is the ancient and discredited, "Buyer, beware."

C. M. Schwab on Steel Earnings

Speaking shortly after midnight of May 26 at the American Iron and Steel Institute dinner at the Waldorf-Astoria, Charles M. Schwab said of present conditions in the steel trade:

"Boys, we are in a period of great prosperity. A man came into our office. He said, 'Mr. Schwab, do you want to buy some steel?' 'What is the price?' 'Four hundred and fifty dollars a share.' 'No, I don't want the stock; I want steel.' 'Well,' said he, 'steel is worth more than the stock.' And that is the condition we are in.

"I wonder if any of us ever expected, anticipated or dreamed that we would see any such state of affairs as we see to-day. Yet I am obliged to say that among the predictions which I have made—and some of them have come true, because I have made so many—was a prediction that we would some time see such a boom and such prosperity as we had never dreamed of. How well do I remember Mr. Morgan asking me, 'Do you believe that the Steel Corporation will ever earn \$70,000,000 a year?' I said, 'Yes, Mr. Morgan, you will see it earn \$200,000,000.' And it is with great pleasure that I have seen that prediction come to pass. It has been the pioneer, it has been the leader, it has been the protector and it has been the standard that has helped us all to get along and shape this business in the manner in which it ought to be shaped. Boys, may this prosperity continue.

"I was delighted beyond measure to hear the address made by Mr. Hurley—one of the most significant, one of the most wonderful and one of the most hopeful I have heard in many days. I can tell you one thing about Hurley. He knows what he is talking about; he has been in competition with me and I know that he knows what he is talking about, and I know that he knows what manufacturing is and what the manufacturers need. And I know that we have reached the time when men with the ability and knowledge that Mr. Hurley has will have to make our business and our country prosperous and successful."

German Machine Tools After the War

Exports of German machine tools before the war amounted to one-third of the total output, says the 1915 report of the Verein Deutscher Werkzeugmaschinen Fabriken of Düsseldorf, stating also that the war having developed a considerably stronger demand, machine tool makers were in general fully occupied. Shell manufacture was also an important item with these plants. The report also refers to the machine tools which were seized in enemy countries and transferred to Germany to use in making shells. Because these will be left in Germany, it is urged that machine tool builders devote more attention to the maintenance of their natural market and their exports. A mutual customs policy between the allied powers of Central Europe is recommended. The German association embraces nearly all the large works.

An appeal by Clarence H. Venner to the United States Circuit Court of Appeals for the Third District of New Jersey, has been taken from the decision of Judge Rellstab, dismissing a temporary restraint in the proposed sale of the Pennsylvania Steel Company of New Jersey to the Bethlehem Steel Company. Mr. Venner is a holder of a small number of shares of common stock.

All production records by the open-hearth department of the Steelton plant of the Pennsylvania Steel Company were broken in May when the output totaled 61,000 tons of steel ingots. This betters the highest previous record by at least 7000 tons. T. T. McEntee is superintendent of the department and Quincy Bent is general manager of the plant.

The Lebanon Valley Iron & Steel Company, Lebanon, Pa., contemplates the addition of a 9-in. mill to its present equipment. Engineers are now working on the plans. John C. Brown is general manager.

CORRESPONDENCE

The Stop Watch and the Lawn Mower

To the Editor: The great danger of the Tavenner bill now before Congress is the almost complete lack of popular knowledge concerning premium and bonus systems of wages, and concerning time studies, the hated symbol of which to the opponents of progressive management is the stop watch. This bill would prohibit in all Government shops the payment of bonus or premium in addition to regular wages, and the use of the stop watch or other time-measuring device. It might be made to apply also to private establishments undertaking contract work for the Government. Fully as important is the influence which would extend in some degree to all industrial establishments, in retarding the extension of systems of management which have proved to be profitable both to employer and employee and which are held in high favor by good workmen, skilled and unskilled, who have had experience with them.

The whole subject may be illustrated in a familiar way, to bring its principles home to those who have not made their acquaintance, probably including some members of Congress. At Mr. Tavenner's home, or that of some other Congressman, is a large lawn which is mowed, at 30c. an hour, by Thomas, who also takes care of the grass in the yards of various neighbors. One afternoon the Congressman notices that the noise of the mower, which has been clicking away since early morning, gets on his nerves. He goes to a window and watches the laboring Thomas. The pace up and down the lawn looks to be unnecessarily slow, and a closer observation discloses the further fact that the width of the cut, the feed of the machine, so to speak, is pretty narrow.

So the Congressman, unjust and unnatural though it be, pulls out his watch and times Thomas on a trip across the grass. It may or may not be a stop watch. It tells him that the trip consumed 3 min. 40 sec. A further timing shows that 20 sec. is consumed at the end of each cut in turning and resting, giving a total of 4 min. The Congressman does not feel stingy about it, but he resents the extra hours of irritating noise.

When Thomas goes home he leaves the mower behind him, and the Congressman decides to make a few tests. Had the workman known what was to happen he would have gnashed his teeth with rage, according to some of the labor leaders. However, his employer pushes the mower at what he considers a fair pace the length of the lawn, timing the trip, mind you, and does it in 2 min. 50 sec. Then he times the turn and decides that 10 sec., including a few moments for a deep breath or two, is a proper allowance. His total is 3 min. The width of the lawn is 100 ft. Why not a broader swath? he asks himself.

So he gets out another instrument of precision, a yard stick. He finds that the cutting blades of the mower are 18 in. long, while the cut made by Thomas was but 8 in. Now he is really interested. He experiments and finds that, allowing a suitable lapping over of swaths, a 15-in. cut would be about right.

The Congressman, little realizing that he is making a scientific time study, continues the investigation in his library, with paper and pencil: "Thomas has been taking 150 trips; the 15-in. swath would mean but 80 trips. Thomas takes 4 min. a trip; he could do it easily in 3 min. The broader cut would mean very little additional muscular exertion. His total time is 4 min. x 150 equals 600 min., or 10 hr. My time would be 3 min. x 80, equals 240 min., or 4 hr. At 30c. an hour the saving of 6 hr. would be \$1.80, to say nothing of the wear and tear on my nerves, while I am preparing my bill to prohibit the use of the stop watch and the payment of premiums for labor in Government shops."

The Congressman knows Thomas to be no intentional laggard, but rather a man who has established his labor in an ambitionless, unthinking rut. He is mowing lawns according to the customs established by his trade. His employer does not wish to discharge him,

and so he works out a neat little plan which should be of benefit to both of them, he believes. A day or two later the monthly bill is presented, and one item reads: "Labor mowing lawn at 30c. per hour, \$3."

When the Congressman pays it he broaches his idea to Thomas: "See here; your bill is all right and here is a check for it. Now you know I hate the clatter of that mower, so I'll tell you what we'll do. I'll pay you the same 30c. an hour for your time and I'll divide with you the wage for all the time you save from 10 hr. We'll call that the standard time. If you cut the grass in 8 hr.—and do it well, of course—you'll get 30c. an hour for the 8 hr. and also 30c. for one additional hour. If it takes you only 4 hr., you'll get 30c. an hour for that and the same rate for 3 hr. additional, half of the 6 hr. you have saved. So you'll receive 7 hr. pay for 4 hr. work, which is \$2.10, or 52c. an hour. Pretty good isn't it? I'll save 6 hr. of noise and the difference between \$2.10 and \$3. You can put in those saved 6 hr. on some other lawn, which at 30c. an hour will give you \$1.80, making your total for the 10 hr. \$3.90. That's better than \$3. Get the idea?"

Thomas thinks it over and figures it out, and finally says: "It seems a pretty good plan, but supposing the grass is wet or something else is wrong and the job takes me 12 hr. What then?" "Oh," replies the Congressman, "that would be all right. You would get your 30c. an hour anyway. I guarantee you the hourly wage."

Inspiration comes to Thomas under the spur of a new ambition. He works out speeds and feeds of his own. The trip time he reduces to 2 min.; he clips the lapping to 1 in., and borrows a neighbor's lawn mower having 24 in. blades, giving him a 23-in. swath and reducing the number close to 50. His total time is 2 min. x 50, or 1 hr. 40 min. He receives his wage for 5 hr. 50 min., which is \$1.75, or more than \$1 an hour for his actual working time. He feels well contented with himself, but is a little shy about telling the Congressman about it, because he does not know what will be said concerning that 24-in. lawn mower.

The Congressman laughs at him. "You're all right, my boy. The idea was yours. You're entitled to the results of it. And you've reduced my bill to \$1.75. The broader the cut the better. Get a 24-ft. mower, if you want to, or a horse mower. We're partners, you see."

Then a neighbor, who is perchance the president of the Lawn Mowers' Union, hears of the arrangement and goes to the householder. "Look here, Mr. Congressman, you ought to be ashamed of yourself. The idea of holding a watch on an honest American workman! And paying him a premium for his labor! Shame! There ought to be a law on the statute books to protect men like Thomas against such an outrage."

And the Congressman, as any sane lawn owner would, tells his critic to go hence. What right has a neighbor or any one else to interfere in a strictly private transaction. "Thomas is pleased; I am pleased; so they can all go hang."

Thomas's viewpoint of industry has been changed. He has found that it pays in dollars and cents to do his best work. He is using his brain to better advantage. He is trying to get his other employers to adopt the same system. And the wise ones (to conclude the parable) are doing so.

JOHN NELSON.

Worcester, Mass., June 1, 1916.

Sulphuric Acid in 1915

The total sulphuric acid production of the United States in 1915 was 3,868,152 net tons of 50-deg. acid, worth \$29,869,080, and 189,795 tons of concentrated acid worth \$2,787,971, according to the U. S. Geological Survey, or a total of 4,057,947 tons. Zinc and copper smelters produced more than 25 per cent of the output. The 1914 output was 3,762,417 net tons of 50-deg. acid.

The exports of 34,737 gross tons in 1915 exceeded all previous records, comparing with only 5882 tons in 1914 and 4325 tons in 1913. In January, 1916, exports were 3691 tons, falling to 1426 tons in February.

Compensation and Vocational Disease

Highest Connecticut Court Refuses an Award — Opposite View Taken by Supreme Bench of Massachusetts

The Supreme Court of Connecticut has just handed down a decision in which it finds that vocational diseases are not included in the meaning of the workmen's compensation act of the State, which provides that an employee shall receive compensation for "personal injury arising out of and in the course of his employment." The element of actual accident must exist; otherwise the employer is not financially responsible, the court holds in the first case of the kind that has come before it.

The decision is very important. The employers of the State will be saved the expenditure of many thousands of dollars a year, so long as the statute stands as it is. The precedent established counts for a good deal. Moreover, the ruling may have an influence toward new legislation, providing for compensation in cases of sickness upon some other basis.

On the other hand the Massachusetts Supreme Court has recently rendered a decision which takes exactly the opposite view of what is essentially the same wording as that of the Connecticut act, as to personal injury arising out of employment. The Massachusetts court, following its own previous decisions, upholds the finding of the Industrial Accident Board in granting compensation to an employee who "received a personal injury arising out of her employment, aggravating and accelerating a weak heart condition to a point of total incapacity to work." There was no accident. The woman's duty was to inspect carpet and sew such places as were defective in the weaving. The roll was mounted to revolve easily, and she pulled it across a table a few inches at a time, stopping when sewing was required. One day she felt something give way about her heart, and it was found that she had a disease of that organ. This could not be classed even as a vocational disease, excepting that her light labor proved too much for the weakened heart.

The Connecticut case, *Miller vs. American Steel & Wire Company*, was typically vocational. The amount involved was trivial, but the issue was so clearly defined that it was used as a test. The claimant had worked in a room in the New Haven works of the company, in which fumes from molten lead arose, and on the floor and throughout the room were particles of lead; as a consequence he contracted lead poisoning. That the disease arose in the course of and out of his employment was conceded. The State commission awarded compensation. The employer carried the case to the final court, taking the ground that an injury such as this does not come within the act. The court upheld this contention.

To make the subject entirely plain, no claim is made by any employer that a disease that is the result of accident should not be compensated for under the statute. Blood poisoning following a wound, or pneumonia following the inhaling of gas in an explosion, is clearly included in "personal injury." But under the Connecticut decision a recent Wisconsin case would have been in favor of the employer. A workman contracted typhoid from drinking water from a well on the premises where he worked. The court of that State held that the compensation act covered the sickness and its cause. But the element of accident did not enter into the issue in any way.

A phrase of law which permits of these opposite interpretations by the supreme courts of Massachusetts and Connecticut might well be clarified by the legislative bodies which created it. As the matter now stands the employers of Connecticut are freed from what otherwise would have been a serious burden. Of the labor of the State 90 per cent comes under the act, a greater proportion than in any other State excepting New Jersey. The employers of Massachusetts hardly know where they stand. The decision in that State,

cited above, was a factor in the recent increase of industrial insurance rates. It impelled one large manufacturing company immediately to adopt compulsory physical examination for its workmen.

In this connection the disease most commonly discussed is tuberculosis, which under the Massachusetts decision may be the cause of numerous claims for compensation. Figures worked out by insurance experts show that "a great many more men die of industrial tuberculosis than are killed in mine fires and boiler explosions, with railroad collisions thrown in." Investigators have classified risks from tuberculosis by occupation, numbering them from 1 to about 100, the higher the number the greater the hazard. The typewriter's hazard is placed at 91. It is estimated that the establishment of a precedent of compensation in the case of a typewriter suffering from tuberculosis would increase the insurance rate on that class of employees six fold. And this disease is only one of many which might be traced to employment, either for its inception or its acceleration to a serious form.

The Connecticut court, in getting at the intention of the General Assembly as to the meaning of the act, points out that the general trend of legislation has been against the inclusion of vocational diseases in the compensation system. Out of 40 foreign acts 27 are limited to injuries accidentally sustained; 9 use the word "injury" without qualifications (as in the Connecticut and Massachusetts statutes), and four expressly mention both injury and disease. Out of the group of 27 four have separate acts providing for workmen's sickness insurance. Of the acts of 31 States and two territories, and that of the Federal Government relating to its employees, 20 are expressly limited to accidental injuries, and 14 use the term "personal injuries" without qualification; but of these four expressly exclude disease except as it results from injury, and the acts of two other States have been authoritatively construed to exclude it.

The Connecticut court says: "In the absence of any definition of occupational disease, the act would include all diseases arising out of and in the course of the employment, and the word injury, if it includes the contraction of disease, includes also the aggravation of disease. So construed our act might also be said to give compensation for the common fate of all who work because they must. The result would be to increase very greatly the cost of compensation insurance, or might either discourage the acceptance of the act by the employers, or make it difficult for any but the young and strong to obtain employment."

The decision brings in highly significant statements from Dr. W. Gilman Thompson in his work on occupational diseases, recently published. Occupational diseases are not new discoveries from the ultimate pathological standpoint, he says. Arteriosclerosis or chronic nephritis produced by lead poisoning does not differ from that condition when induced by alcoholism or other toxic causes. As a further illustration, the case of bone necrosis from phosphorous poisoning does not differ from necrosis of other origin. It may be claimed that the workman is a victim of chronic lead poisoning; "but are his arteriosclerosis and nephritis due exclusively to lead poisoning, or are alcohol, syphilis or gout the underlying causes? Is his neuritis due to arsenic or alcohol? Was he tuberculous before he undertook work in the pottery, or did his work contribute to the disease? Are his chronic bronchitis, anæmia and malnutrition due to chronic gas poisoning acquired as a garment presser, or are they due to defective hygiene at home, poor food, lack of exercise and the strain and anxieties of poverty? Such are the types of question which arise in connection with occupational disease." Take the case of death or incapacity resulting from an

occupational disease gradually acquired while at work for different employers. Should the last employer bear the whole burden?

Employers who have investigated these questions do not say that vocational disease should be no financial affair of theirs. They maintain, however, that if this responsibility is to be placed upon them it should be controlled by wise laws, framed after careful study by competent men. The solution may be in some form of health insurance, such as that which has been in operation in Germany for some time, employer, employee and State contributing to the fund; worked out scientifically in its details of operation, so that such matters as those of division of responsibility where a claimant has had several employers are attended to with little friction of interests.

Varnish Company Gives Employees Life Insurance

The Moller & Schumann Company, manufacturer of Hilo varnishes, Brooklyn, N. Y., through the Equitable Life Assurance Society, has insured the lives of every one in its employ, from the president down, including all branch offices. A letter of announcement by the company to each employee says: "We are constantly mindful of the loyalty and efficiency of our employees and appreciate those qualities upon which the continued success of the company depends. After careful study as to the best method of showing our appreciation, it has been decided to furnish and maintain for all employees, without expense to them, an insurance policy in a substantial sum. It gives us pleasure, therefore, to announce that you are protected by life insurance to the extent of substantially one full year's salary, with a limit of \$3,000 to any one employee, payable to his or her beneficiary in the event of death while in the employ of this company." The issuing of a group policy, where more than 100 lives are insured, obviates the necessity of individual medical examination and makes possible the inclusion of some who might not be able to pass the examination required for individual insurance.

New Employment Bureau at New Britain

Seventeen of the larger manufacturing concerns in New Britain, Conn., have become affiliated with the Manufacturers' Association of Hartford County and a branch employment bureau of the association will be established in New Britain. Among the metal-working companies which have joined the association are Russell & Erwin Company, Corbin Screw Corporation; P. & F. Corbin, Cabinet Lock Company, National Spring Bed Company, Landers, Frary & Clark, Hart & Cooley, Fafnir Bearing Company, Traut & Hine, the Skinner Chuck Company, Hart & Hutchinson, Union Mfg. Company, North & Judd Mfg. Company, Stanley Rule & Level Company, Stanley Works, New Britain Machine Company, Beaton & Cadwell Mfg. Company. The total membership of the association is now 101, and 40,000 employees are represented.

Seven claims for damages under the workmen's compensation law have been filed with the Industrial Commission of Wisconsin as the result of the recent decision of the State Supreme Court in the case of a widow who sued at common law to recover damages for the death of her husband from typhoid fever, alleged to have been contracted from a contaminated source of drinking water supply furnished by the employer. The court held that, if the plaintiff is entitled to recover, the Industrial Commission is the proper tribunal to determine the matter.

The Pennsylvania Industrial Board, which must approve all safety devices before they may be used in the State, has formulated the following rule: "All applications for the approval of the board must be accompanied by the article itself or a working model for which application for approval is made. In all cases where the article has been approved by the Underwriters' Laboratories, the copy of such approval shall accompany said application."

CONTENTS

Fixing Individual Wage Rates on Facts.....	1375
Electric Steel at Sheffield.....	1379
Harder Alloys of Copper.....	1379
Manufacture of Motor Truck Worm Drives.....	1380
Graphite in the United States in 1915.....	1381
Vacuum-Melted Pure Iron.....	1382
High Temperature Furnace Cement.....	1383
The Economical Use of Blast Furnace Gas.....	1384
Iron-Ore Output 55,000,000 Tons.....	1389
Notable Operation of a Minnesota Blast Furnace.....	1389
Water in Coal.....	1389
Tungsten and Antimony from Bolivia.....	1389
Sheet Annealing Furnaces.....	1390
Germany's Iron and Steel Output at New War Records.....	1391
Manganese Exports from India Larger.....	1391
April Exports of Iron, Steel and Machinery.....	1392
International Harvester.....	1393
Steel Production After the War.....	1394
A New Machine Tool Evolution.....	1395
The Fixed Resale Price.....	1395
C. M. Schwab on Steel Earnings.....	1396
German Machine Tools After the War.....	1396
Correspondence.....	1397
Sulphuric Acid in 1915.....	1397
Compensation and Vocational Disease.....	1398
Varnish Company Gives Employees Life Insurance.....	1399
New Employment Bureau at New Britain.....	1399
How to Prepare Industrially.....	1400
Iroquois Iron Company's New Officers.....	1401
May Lake Ore Shipments the Largest.....	1401
Furnace Built in 85 Days.....	1401
Progress at the Australian Steel Plant.....	1401
New Pig Iron Record.....	1402
Blast Furnace Notes.....	1403
New Records at South Bethlehem.....	1403
New Locomotive Orders.....	1403
Iron and Steel Markets.....	1404
Iron and Industrial Stocks.....	1414
Ferromanganese Imports.....	1414
Finished Iron and Steel Prices, Pittsburgh.....	1415
Metal Markets.....	1416
Sheet Metal Meeting.....	1417
National Association of Corporation Schools.....	1417
P. T. Dillon Buys Delaney Forge.....	1417
Personal.....	1418
Obituary.....	1419
Wheeling-Connellsville Railroad Projected.....	1419
Meeting of Drop Forge Association.....	1419
Pittsburgh and Nearby Districts.....	1420
Strikes and Wage Advances.....	1421
Machinery Markets and News of the Works.....	1422

HOW TO PREPARE INDUSTRIALLY

James Gayley on the Awakening of War and Its Lessons for This Country

In his remarks at the dinner of the American Iron and Steel Institute in New York, May 26, James Gayley touched on some vital considerations in the relation of manufacturers to the preparedness program. What he said is reported below in full:

"In these days people are showing their interest in preparedness by parades, and men are arranging to attend training camps, and women are training for hospital service in preparation for military purposes. There is also preparation being made by private organization and capital for expanding our foreign trade, and there is a program to prepare industries for war; but I wish to direct your attention to some features in preparation for competition which I think are fundamental.

"We have been told that France was retrograding; that England was unprogressive and her manufacturing was in a rut, but the war has awakened them. We behold to-day compact, highly efficient nations working out their destiny with a single purpose and in a most masterly way. It may be true that the English nation has been slow moving and deliberate, but the war has changed all that. You know when supreme trial overtakes an acquaintance whom till then we conceived we knew, how the man's nature changed past knowledge or belief.

"So we have seen these nations transformed beyond our every conception. In those countries to-day all forces work outward to the front, like a chain of buckets toward a conflagration; everybody has his or her bucket, little or big, and nobody disputes how they shall be used.

EUROPE WILL NOT BE SERIOUSLY CRIPPLED

"It is thought that the nations at war will be so burdened with debt that any progress will be hindered for a long time, and that so many men have been killed or injured that it will cripple their industries and we will be advantaged accordingly. I doubt that advantage to be anything but a temporary one. Our national debt is about \$10 per capita, and if the war lasts until the end of the year, the average per capita debt of the nations at war will be at least twenty times as great as ours; but England's debt per capita was much greater after the Napoleonic wars a century ago.

"That those nations will be seriously crippled in men, I doubt very much. They are densely and overpopulated and a diminution may work little harm from a manufacturing standpoint. Many have been and will be killed, and many more will be wounded, but back of the men at the front engaged in war activities are vast armies of men being prepared by thorough training for war, who will be most effective in the time of peace.

"The chief dependence to-day of a nation at war is on the physical fitness of the individual, and with a nation trained into physical fitness, that fitness translated into times of peace makes the nation far more efficient in manufacturing and business.

"The warring nations have also learned the necessity of economy—the spirit of patience and the advantage of co-operation which will be continued in times of peace.

GERMANY'S GREAT LOSS

"England, a non-military nation, has learned a lesson from German efficiency and profited by it, and after the war ends will carry that efficiency into manufacturing and every branch of trade. If I mistake not, Germany will count as her greatest loss in the years to come, that through the disclosures she has made of the value of efficiency and organization, which will be adopted by other nations, she has built up an enduring force of competition against her in trade and in every form of national endeavor.

"What are we doing to keep pace with these nations

that have been rejuvenated through a war which has awakened them as never before?

"We have in national thought traveled along conservative lines, as an inheritance of our ancestry. We have been lulled into a sense of security by reason of our supposed isolation by oceans, and we have aimed to be neutral. Nature has endowed this country with rich raw material and fertile soil. The climate gives the people energy and by the expenditure of that energy on raw material in mines and furnaces, and by cultivating the soil, great wealth has been produced, which makes a people complacent. May not this complacency as to the future bring it about that the warring nations will become the younger nations of the world, and we one of the older nations? For the age of a nation as reckoned to-day is not in its life's history alone, nor its abundance of relics of the past, which Matthew Arnold pronounced 'but the trumpery of a thousand years,' while the youthfulness of a nation is determined by its progressiveness and efficiency.

"We have seen Germany's efficiency in war, and we know what it is in manufacturing and in trade, and her efficiency will continue. Here is a nation not blessed with rich raw material as compared with this country, but they have applied to their problems 75 years of technical education and scientific training, thorough and highly specialized, and organized in its efforts. The military training has made the men physically fit, and the application of physical energy under direction of trained specialists has created an efficient Germany in all lines of manufacturing and national work.

"Can we think that the Allies, having learned so much from German efficiency in war, will not follow out her German efficiency in times of peace, after the period of reconstruction is ended?

EDUCATIONAL NEEDS AT HOME

"There is much that we can do as individuals in furthering the work of preparedness to meet competition. Most of our higher institutions of learning are supported through individual benefaction. To every man who has won wealth there is no greater opportunity to expend his wealth for the good of his country and erect an enduring monument for himself, than to freely endow departments of institutions providing a technical education; in establishing schools for research work to better use and to economize raw material, expanding the work now carried on by some corporations; in establishing schools of commerce and international finance, and industrial schools in manufacturing centers. Back of all this, and in order to make the individual thoroughly fit for the nation's work, there should be a compulsory system of physical and military training in our schools and educational institutions as a certain step toward efficiency.

"Military training in schools is much misunderstood. It is not a preparation for defense alone. There is a distinction between a nation prepared and a nation in constant readiness for transition to war. It is an education in the duties of the citizen to the state, and to impress upon the young men that a part of their efforts is for the benefit of the nation and not all of it for themselves.

"It is not the 'old school' method of bending the will by blind, unreasoning obedience, but to use the individual will in concerted action, which is the basis of efficiency, and besides, it brings the individual to manhood physically fit for the duties of life. We need to train our young men in highly specialized lines, supplementing it with physical efficiency and directing it by intelligent organization."

A Diesel oil engine for submarine use, designed to develop 600 hp., has been completed at the plant of the Busch-Sulzer Brothers-Diesel Engine Company at St. Louis, Mo., and will be installed in the L-8 now being built for the United States Navy by the Lake Submarine Company. The factory test has shown a development of 675 hp., or 12½ per cent above the requirements. The construction of the engine has been under the supervision of naval officers. It will be shipped to Portsmouth, N. H., for installation in the L-8 in about three weeks.

Iroquois Iron Company's New Officers

At the annual meeting on June 1 of the stockholders of the Iroquois Iron Company, Chicago, the following directors were elected: Charles T. Boynton, Harry Conby, Clifford D. Caldwell, H. H. S. Handy, Clayton Mark, Anson Mark, Nathan L. Miller, Ferdinand Schlesinger, Armin Schlesinger, Edward G. Wilmer and Charles P. Wheeler. In the personnel of this directorate is indicated a remarkable association of interests, including the Schlesinger ore properties, the Conby shipping facilities, the By-Product Coke Corporation's fuel operations, the Iroquois pig-iron unit, the Mark steel finishing mills and the Pickands-Brown selling organization.

Officers were elected as follows: Ferdinand Schlesinger, chairman of executive committee; Charles P. Wheeler, president and treasurer; Charles T. Boynton, vice-president; Clifford D. Caldwell, secretary; Seymour Wheeler, assistant treasurer; Donald S. Boynton, second vice-president and assistant secretary, and Charles A. Stillman, assistant to the president.

The operating organization at the furnaces, of which E. L. Ives is in charge, will continue unchanged. Except that two stacks will soon operate continuously on Bessemer iron for the Mark Mfg. Company's new plant, the business of the Iroquois Iron Company is to be continued practically as heretofore, manufacturing various grades of foundry pig iron for the merchant trade. No change for the present will be made in the selling arrangements, and the company's product will be marketed through Rogers, Brown & Co., and the general offices of the company will be maintained at their present location.

The Mark Mfg. Company, as a preliminary of financing its new steel mill at Indiana Harbor, the cost of which is estimated at \$5,000,000, has issued first mortgage 6 per cent bonds to the amount of \$4,000,000. The security back of these bonds will include, in addition to the new plant, other property of the company valued at \$3,538,000.

May Lake Ore Shipments the Largest

Iron-ore shipments from the Lake Superior region in May were 8,449,580 gross tons, the largest for one month ever recorded. In July, 1913, the total was 8,204,416 tons, which was a record. The comparative shipments by ports for May and for the season were as follows in gross tons:

	May, 1915	May, 1916	To June 1, 1915	To June 1, 1916
Escanaba	479,259	1,045,186	528,566	1,443,400
Marquette	178,927	561,555	183,365	614,813
Ashland	513,715	955,041	557,665	1,102,893
Superior	763,889	1,722,341	851,064	1,933,681
Duluth	1,974,321	2,671,044	2,149,310	3,209,325
Two Harbors	1,102,248	1,494,413	1,246,222	1,803,879
Total	5,012,359	8,449,580	5,516,192	10,107,991
Increase, 1916		3,437,221		4,591,799

The May increase of 3,437,221 tons over 1915 is 68.57 per cent, while to June 1 the increase is 83.24 per cent, insuring a record season. The Duluth and Superior percentage of the total to June 1 this year was 50.90 per cent, against 54.39 per cent last year, but the Escanaba proportion is higher this year, being 14.27 per cent, against 9.59 per cent last year.

The Union Carbide Company, Niagara Falls, N. Y., has started the erection of a large calcium carbide plant at Saude, near Bergen, Norway. Power is cheaper there than here, as well as labor. The company plans to take care of its export business from the Norwegian plant and also of its coast business in this country, since carbide can be made there and shipped back cheaper than it can be made here.

The American Manganese Steel Company, Chicago, which recently acquired the plant of the Brylgon Steel Casting Company, New Castle, Del., is converting it into a manganese steel foundry and expects to produce such castings by July 15. The monthly capacity will be about 400 tons. The company now has two plants at New Castle and one at Chicago Heights, Ill.

FURNACE BUILT IN 85 DAYS

A New Record in the Construction of No. 9 Cambria Stack at Johnstown, Pa.

On Monday, June 5, at 12.45 p. m., No. 9 blast furnace of the Cambria Steel Company at Johnstown, Pa., was put in blast, and it is believed the time in which it was erected breaks all records in the construction of a large blast furnace. The building of the furnace was authorized on March 6 last. The general layout was approved on March 9, and a site was selected and active work on the foundations started on March 12. Before the foundations were started it was necessary to clear the site, which consumed some little time. In just 85 days from the time the stack was authorized it was completed and put in blast.

The furnace foundations were finished on April 7, and 29 days later the erectors of the steel work had completed their task. Seven days later the furnace was lined and also the bleeders and the bustle pipe. Extensions were made to the boiler house to take care of 12 300-hp. Babcock & Wilcox boilers equipped with superheaters. The blowing engine house was also extended to accommodate a 40 x 86 x 84 x 60 Hooven-Owens-Rentschler Company blowing engine, the air end of which was designed by E. E. Slick, vice-president and general manager of the Cambria Steel Company, in order to facilitate quick delivery. The furnace is 90 ft. high, 22 ft. in diameter at the bosh. There are four side combustion hot blast stoves, 24 x 100 ft. The stock filling equipment includes an Otis skip hoist. The stack is rated at 500 to 550 tons of iron per day, and was blown in on basic iron.

All nine furnaces of the Cambria Steel Company are in blast, turning out close to 4500 tons of pig iron per day. The company also has 19 basic open-hearth furnaces and one acid open-hearth furnace at its Franklin works, and seven basic and one acid open-hearth furnace at the Cambria works. The Bessemer department has four Bessemer converters of 12½ tons capacity each and the company is making Bessemer and open-hearth steel ingots at the rate of 1,750,000 tons per year.

Progress at the Australian Steel Plant

The Broken Hill Proprietary Company's plant at Newcastle, N. S. W., in the four weeks ended Feb. 9, 1916, made 9890 tons of pig iron and 7967 tons of steel ingots, while the blooming mill handled 7118 tons of ingots producing billets for shell steel and rails. The rail mill, which has rolled large quantities of shell steel bars, rolled 5823 tons of rails. The coke output in the same period was 9200 tons, which was used in the blast furnaces, and 87,206 gal. of tar was produced and sold. Construction work on four new open-hearth furnaces is proceeding, the three in operation being unable to take the pig-iron output of the blast furnaces. For the six months ended Nov. 30, 1915, 37,311 tons of steel ingots were poured and 26,573 tons of commercial steel rolled.

The Morgan Engineering Company, Alliance, Ohio, has taken an order for 26 electric traveling cranes, of 10 to 40 tons capacity, for the new McDonald mill to be erected by the Carnegie Steel Company, between Girard and Niles, Ohio.

The Japanese are paying much attention to Australian ores suitable for refining or smelting in Japan. A party of Japanese engineers is about to visit Australia to make a study of this question.

The Central Iron & Steel Company, Harrisburg, Pa., broke all its production records in May when 13,618 tons of steel plates was turned out. Robert H. Irons is superintendent.

NEW PIG-IRON RECORD

Production 3,351,073 Gross Tons in May

Previous Indications Confirmed, That Nearly
Maximum Possible Production Has
Been Reached

Pig-iron production went to a new high point in May at 3,351,073 tons, which is 108,099 tons a day. This compares with 3,227,768 tons in April, or 107,592 tons a day, and 3,337,691 tons in March (the last preceding 31-day month) or 107,667 tons a day. The steel companies made practically all the increase, the merchant output being very close to that of April. Seven furnaces were blown in in May and eight were blown out, so that the number in blast June 1 was 321, with a daily capacity of 108,386 tons, which compares with a capacity of 109,072 tons for 322 furnaces on May 1. Three furnaces have been blown in since the opening of June, including the new No. 9 Cambria stack at Johnstown.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from May, 1915, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons			
	Steel Works	Merchant	Total
May, 1915	54,655	18,360	73,015
June	59,022	20,339	79,361
July	62,895	19,796	82,691
August	67,801	21,865	89,666
September	70,977	24,108	95,085
October	73,595	27,227	100,822
November	73,282	27,962	101,244
December	73,647	29,686	103,333
January, 1916	72,614	30,132	102,746
February	75,305	31,151	106,456
March	76,274	31,393	107,667
April	77,226	30,366	107,592
May	77,706	30,393	108,099

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in May and the three months preceding:

Monthly Pig-Iron Production—Gross Tons				
	Feb. (29 days)	Mar. (31 days)	Apr. (30 days)	May (31 days)
New York	191,648	205,034	189,312	210,464
New Jersey	0	0	1,538	6,886
Lehigh Valley	104,207	109,598	112,210	117,870
Schuylkill Valley	90,507	94,264	90,753	94,254
Lower Susquehanna and Lebanon Valley	61,362	63,142	69,407	80,293
Pittsburgh district	717,928	793,910	752,068	750,903
Shenango Valley	185,161	193,432	191,700	195,867
Western Pennsylvania	170,597	175,738	165,790	167,913
Maryland, Virginia and Kentucky	85,056	93,376	90,584	94,302
Wheeling district	110,105	120,222	127,101	131,764
Mahoning Valley	310,742	334,527	309,045	314,739
Central and Northern Ohio	240,271	247,833	239,963	274,693
Hocking Valley and Hanging Rock	45,850	53,237	50,120	46,079
Chicago district	428,257	479,659	467,147	481,714
Mich., Minn., Mo., Wis. and Col.	95,806	113,099	119,634	127,278
Alabama	226,688	235,483	227,417	228,439
Tennessee	23,027	25,137	25,424	32,815
Total	3,087,212	3,337,691	3,227,768	3,351,073

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in the figures below, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons					
	Pig, total production			Spiegeleisen and ferromanganese	
	1914	1915	1916	1914	1915
Jan.	1,261,430	1,115,944	2,251,035	17,325	18,041
Feb.	1,329,414	1,237,380	2,183,845	10,524	13,319
Mar.	1,704,688	1,551,082	2,365,116	20,133	12,274
Apr.	1,635,226	1,584,111	2,316,768	18,676	12,337
May	1,457,847	1,694,290	2,408,890	21,504	13,440
June	1,329,623	1,770,657	.....	16,254	19,200
July	1,395,851	1,949,750	.....	16,524	17,854
Aug.	1,455,054	2,101,818	.....	11,577	27,463
Sept.	1,390,322	2,129,322	.....	13,786	23,159
Oct.	1,271,820	2,281,456	.....	17,435	23,992
Nov.	1,059,159	2,198,459	.....	21,977	28,741
Dec.	1,034,802	2,283,047	.....	20,733	25,004

CAPACITY IN BLAST JUNE 1 AND MAY 1

The following table shows the daily capacity in gross tons of furnaces in blast June 1 and May 1 by districts:

Coke and Anthracite Furnaces in Blast					
Location of furnaces	Total number of stacks	June 1—Number in blast	June 1—Capacity per day	May 1—Number in blast	May 1—Capacity per day
New York:					
Buffalo	19	17	6,174	17	5,915
Other New York	5	3	615	3	605
New Jersey	6	1	216	1	154
Pennsylvania:					
Lehigh Valley	20	14	3,615	13	3,429
Spiegel	2	2	212	2	229
Schuylkill Val.	12	10	3,040	10	3,025
Lower Susquehanna	6	5	1,515	5	1,316
Lebanon Valley	7	6	917	6	910
Ferro and Spiegel	2	2	183	2	186
Pittsburgh Dist.	53	51	23,824	52	25,146
Ferro	3	3	398	2	257
Shenango Val.	19	19	6,076	19	6,390
Western Pa.	22	17	5,328	18	5,481
Ferro and Spiegel	4	1	75	2	100
Maryland	3	3	1,260	3	1,238
Ferro	1	1	112	1	116
Wheeling Dist.	14	13	4,396	13	4,563
Ohio:					
Mahoning Val.	25	24	10,153	24	10,502
Central and Northern	24	23	8,984	22	8,353
Hock. Val. and Hanging Rk.	15	10	1,536	11	1,671
Ill. and Ind.	35	32	16,055	31	15,125
Ferro	1	1	84	1	80
Michigan, Wis. & Minn.	12	11	3,043	10	2,895
Col. and Mo.	6	3	1,015	3	998
Ferro	1	0	0	1	101
The South:					
Virginia	18	7	826	10	1,180
Kentucky	5	4	628	4	566
Alabama	38	27	7,112	28	7,650
Tennessee	15	11	994	9	890
Total	393	321	108,386	322	109,072

Furnaces blown in in May include one Lock Ridge in the Lehigh Valley, Sheridan in the Lebanon Valley, one River in Ohio, Wayne in Michigan, one Bon Air and one Rockwood in Tennessee.

Among the furnaces blown out are Claire in the Shenango Valley, Newport in western Pennsylvania, one Low Moor, Oriskany and Pulaski in Virginia, Jisco in the Hanging Rock district, one spiegel furnace in Colorado and one Ensley in Alabama.

THE RECORD OF PRODUCTION

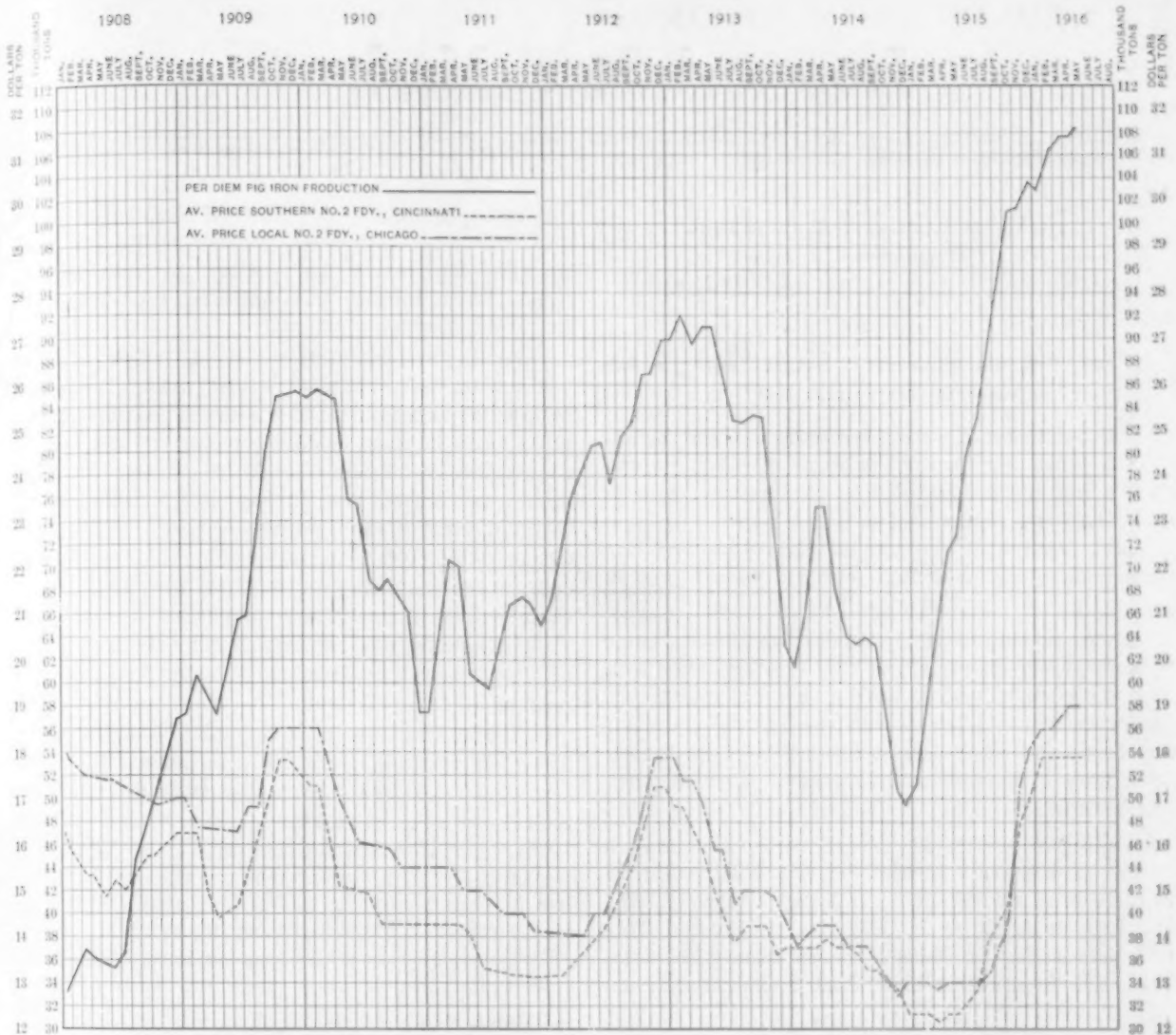
Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1912—Gross Tons					
	1912	1913	1914	1915	1916
Jan.	2,057,911	2,795,331	1,885,054	1,601,421	3,185,121
Feb.	2,100,815	2,586,337	1,888,670	1,674,771	3,087,212
Mar.	2,405,318	2,763,563	2,347,867	2,063,834	3,337,691
Apr.	2,375,436	2,752,761	2,269,655	2,116,494	3,227,768
May	2,512,582	2,822,217	2,092,686	2,263,470	3,351,073
5 mo.	11,452,062	13,720,209	10,483,932	19,719,990	16,188,865
June	2,440,745	2,628,565	1,917,783	2,380,827	.....
July	2,410,889	2,560,646	1,957,645	2,563,420	.....
Aug.	2,512,431	2,545,763	1,995,261	2,779,647	.....
Sept.	2,463,839	2,505,927	1,882,577	2,852,561	.....
Oct.	2,689,933	2,546,261	1,778,186	3,125,491	.....
Nov.	2,630,854	2,233,123	1,518,316	3,037,308	.....
Dec.	2,782,737	1,983,607	1,515,752	3,203,322	.....
Total	29,383,490	30,724,101	23,049,752	29,662,566	.....

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The figures for daily average production, beginning January, 1909, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1909—Gross Tons									
	1909	1910	1911	1912	1913	1914	1915	1916	
Jan.	57,975	84,148	56,752	66,384	90,172	60,808	51,659	102,746	
Feb.	60,976	85,616	64,090	72,442	92,369	67,453	59,813	106,456	
Mar.	59,232	84,459	70,036	77,591	89,147	75,738	66,575	107,667	
Apr.	57,962	82,792	68,836	79,181	91,759	75,665	70,550	107,592	
May	60,753	77,102	61,079	81,051	91,039	67,506	73,015	108,099	
June	64,656	75,516	59,585	81,358	87,619	63,916	79,361	.....
July	67,793	69,305	57,841	77,738	82,601	63,150	82,691	.....
Aug.	72,546	67,963	62,150	81,046	82,057	64,363	89,666	.....
Sept.	79,507	68,476	65,903	82,128	83,531	62,753	95,085	.....
Oct.	83,856	67,520	67,811	86,722	82,133	57,361	100,822	.....
Nov.	84,917	63,659	66,648	87,697	74,453	50,611	101,244	.....
Dec.	85,022	57,349	65,912	89,766	63,987	48,896	103,333	.....

The fluctuations in pig-iron production from January, 1908, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of South-



A New High Point in American Pig-Iron Production—A Daily Rate of 108,099 Tons

Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from Jan. 1, 1908, to June 1, 1916; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

ern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE.

Blast Furnace Notes

The lease on the Standard Iron Company's furnace at Goodrich, Tenn., under which J. J. Gray, Jr., operated it for several months, expired April 30. In the period of the lease the furnace was making ferro-phosphorus. The Standard Iron Company is now producing pig iron.

The furnace of the LaFollette Iron Company at LaFollette, Tenn., will be out of blast this week and a portion of next week for repairs.

The Virginia Iron, Coal & Coke Company blew in its Radford Crane furnace at Radford, Va., June 2.

The pig-iron output of the Wheeling Steel & Iron Company, because of a broken cylinder in one of the blowing engines of its Martins Ferry blast furnace, fell off somewhat in May. The furnace is now operating with both engines.

The Keystone furnace of the Reading Iron Company, Reading, Pa., idle since February because of an accident, was blown in June 2. It has a weekly capacity of 1800 tons.

One Gary, Ind., furnace was blown in June 1 and all eight furnaces in that group are now in blast. With Keystone at Reading and No. 9 Cambria at Johnstown, Pa., going in since June 1, pig-iron output is now pro-

ceeding at a rate about 1400 tons greater than at the beginning of the month.

New Records at South Bethlehem

Figures given out by the Bethlehem Steel Company show that a number of records at the South Bethlehem plant were broken in May. The exceptional performances are indicated in the following: Blast furnaces, total production, 80,171 tons; best previous production, October, 1915, 79,169 tons. Furnace "A" for month, 17,212 tons; best previous record, December, 1914, 16,779 tons. Open-hearth furnace No. 3, 14,620 tons for May; best previous record, March, 1916, 12,693 tons. Merchant mills: 22-in. mill, No. 2, 8181 tons; best previous record, March, 1916, 7670 tons. Saucon plant, 28-in. structural mill, 8808 tons; best previous record, March, 1916, 8414 tons.

New Locomotive Orders

Locomotive orders thus far in June exceed 115, maintaining the previous high rate for this year. The Lehigh Valley has ordered 40 Santa Fe and 30 Pacific locomotives from the Baldwin Locomotive Works, and the American Locomotive Company will build 24 six-wheel locomotives for the Egyptian State Railways and 7 consolidated type for the Cuban Central Railways. The Lehigh Valley has ordered 55 new locomotives in the last eight months, besides the above order of 70.

Iron and Steel Markets

SPOT PRICES EASIER

May Shows Heavy Sales and Shipments

Pig-Iron Output at a New High Mark—Manganese Supply Increasing

The tendency of prices for early delivery to approach those for forward delivery is more marked in the heavier finished lines—particularly in bars and structural shapes and to a less degree in plates. In that feature of the market close observers are confirmed in the judgment recently passed that in prices the crest of the wave has been seen.

Those producers whose policy has been to cater to high-priced spot business find now and then that they have space, and in such a case the mill makes the price, whereas for months the buyer's eagerness has made it. Such orders are not a large factor, with most mills well sold into next year, but they are indicative.

Taking pig iron as the measure, May was a month of high-rate production, the total being 3,351,073 tons, or 108,099 tons a day, against 3,227,768 tons in April, or 107,592 tons a day, and 107,667 tons a day in March, the previous high rate. With 321 furnaces in blast June 1 the capacity active was 108,386 tons a day, against 109,072 tons a day for 322 furnaces at the beginning of May.

Three furnaces have blown in since this month opened, so that production is now at the yearly rate of about 40,300,000 tons. But furnaces keep going out for repairs and on its present base the industry strains hard for any output above the 40,000,000-ton mark.

The ferromanganese and spiegeleisen output last month was the country's largest—35,844 tons. For 1915 the monthly average was but 19,570 tons. The manganese situation, from the standpoint of both home production and imports, is working easier.

Apart from the record output, the chief interest in pig iron is in the export business. The week's sales to Italy of Bessemer and basic are put above 20,000 tons and on further considerable inquiries Central Western furnaces have quoted Bessemer iron at \$21 at furnace. The home pig-iron market is dragging, and weakness in Southern iron is more pronounced. Around Chicago and in some other districts Southern sellers have a free hand at their present prices.

Recent buying of basic iron in eastern Pennsylvania brought out lower prices and both basic and foundry irons show a recession there of 25c. to 50c.

More is heard of the offering of higher carbon billets and blooms which were not accepted for munitions uses, probably 150,000 tons having accumulated at large steel works. While not suitable

for many common uses, this steel has replaced soft steel billets in some cases, prices ranging from \$30 to \$42. Deliveries are better on semi-finished steel. Some inquiry has appeared for sheet bars on fourth quarter contracts.

The finished material situation, judged by May production, shipments and new orders, promises no marked change for some months. Generally the mills made no gain on orders; some of the largest companies ended the month with an increase, though not a great one, in their obligations. In the Chicago district the leading producer, with a May output of 400,000 tons, broke all records; yet indications are that the oversold condition of the mills there will be emphasized as summer advances.

The new Duluth mill, which has sent 25,000 tons of steel a month to Chicago, will now finish its own product.

Prompt Bessemer steel bars can now be had at 2.75c., Pittsburgh, which is a considerable concession from the recent price for such delivery; yet bars have sold at 2.60c. for the second half of 1917. For the first half of next year 2.50c. has looked high to implement makers, who are still taking in bars bought at 1.50c., and agricultural contracts for 1917 are not closing up rapidly.

The amount of European business offered the steel companies is very large, in spite of much threshing over of the same straw. The Russian barb wire requirements, which run between 150,000 and 200,000 tons, may be divided among three or four producers.

High-speed steel has eased off materially and is now to be had at \$2.75 as against \$3.50 at the top. Welding high-speed steel tools to low carbon steel shanks, the common economy forced by the high price, has had its effect on demand.

Pittsburgh

PITTSBURGH, PA., June 6, 1916.

The usual summer dullness is already being felt in the steel trade. New buying is light, but shipments by the mills against contracts are heavy and the demands on the mills from customers nearly as urgent as at any time for some months. Briefly, the situation is that the mills are sold up on practically all forms of finished iron and steel for the remainder of the year, while consumers are largely covered on their needs for a similar period and are not buying anything for delivery six to nine months ahead at present high prices. There are two sets of prices in the market. One set is mill prices, which on steel bars and shapes are 2.50c., and on plates 2.75c., at mill, these prices being for delivery at convenience of the mill, which would be in last quarter of this year or first quarter of next year. The other is the warehouse and prompt delivery price, which on steel bars is 3c. and higher; shapes, 3c. to 3.50c., and plates, 3.50c. to 4c. or higher. Some mills report they have made sales of steel bars and shapes at 2.75c., against specific jobs for delivery in six or nine months, and on plates at 2.75c. They are discouraging customers from placing orders for last quarter of this year and first quarter of next, knowing that if conditions should materially change the material would not be taken out.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

Pig Iron, Per Gross Ton:	June 7, 1916.	May 31, 1916.	May 10, 1916.	June 9, 1915.
No. 2 X, Philadelphia....	\$20.25	\$20.50	\$20.50	\$14.25
No. 2, Valley furnace....	18.00	18.00	18.50	12.75
No. 2 Southern, Cin'ti....	17.65	17.90	17.90	12.40
No. 2, Birmingham, Ala....	14.75	15.00	15.00	9.50
No. 2, furnace, Chicago*..	19.00	19.00	19.00	13.00
Basic, del'd eastern Pa....	20.00	20.50	20.50	13.50
Basic, Valley furnace....	18.00	18.00	18.00	12.50
Bessemer, Pittsburgh....	21.95	21.95	21.95	14.70
Malleable Bess., Ch'go*..	19.50	19.50	19.50	13.00
Gray forge, Pittsburgh....	18.70	18.70	18.70	13.45
L. S. charcoal, Chicago....	19.75	19.75	19.75	15.75

Billets, etc., Per Gross Ton:	June 7, 1916.	May 31, 1916.	May 10, 1916.	June 9, 1915.
Bess. billets, Pittsburgh..	45.00	45.00	45.00	20.00
O.-h. billets, Pittsburgh..	42.00	42.00	45.00	20.00
O.-h. sheet bars, P'gh....	42.00	42.00	45.00	21.00
Forging billets, base, P'gh	69.00	69.00	69.00	26.00
O.-h. billets, Phila.....	50.00	50.00	50.00	22.02
Wire rods, Pittsburgh....	55.00	60.00	60.00	25.00

Finished Iron and Steel,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47 1/2	1.47 1/2	1.47 1/2	1.25
O.-h. rails, heavy, at mill	1.56 1/2	1.56 1/2	1.56 1/2	1.34
Iron bars, Philadelphia...	2.65 1/2	2.65 1/2	2.65 1/2	1.17 1/2
Iron bars, Pittsburgh....	2.60	2.60	2.60	1.25
Iron bars, Chicago.....	2.35	2.35	2.35	1.20
Steel bars, Pittsburgh....	2.75	3.00	3.00	1.20
Steel bars, New York....	2.99 1/2	3.16 1/2	3.16 1/2	1.36 1/2
Tank plates, Pittsburgh..	3.75	3.75	3.75	1.15
Tank plates, New York...	3.91 1/2	3.91 1/2	3.91 1/2	1.31 1/2
Beams, etc., Pittsburgh...	2.60	2.60	2.60	1.20
Beams, etc., New York...	2.66 1/2	2.76 1/2	2.76 1/2	1.36 1/2
Skelp, grooved steel, P'gh	2.35	2.35	2.35	1.15
Skelp, sheared steel, P'gh	2.45	2.45	2.45	1.20
Steel hoops, Pittsburgh..	2.75	2.75	3.00	1.30

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	June 7, 1916.	May 31, 1916.	May 10, 1916.	June 9, 1915.
Sheets, black, No. 28, P'gh	2.90	2.90	2.90	1.75
Galv. sheets, No. 28, P'gh	4.75	4.75	5.00	4.50
Wire nails, Pittsburgh...	2.50	2.50	2.50	1.55
Cut nails, Pittsburgh....	2.60	2.60	2.60	1.55
Fence wire, base, P'gh...	2.45	2.45	2.45	1.35
Barb wire, galv., P'gh...	3.35	3.35	3.35	2.40

Old Material, Per Gross Ton:

Iron rails, Chicago.....	18.50	17.50	18.00	12.25
Iron rails, Philadelphia..	20.00	20.00	20.00	15.00
Carwheels, Chicago	12.75	12.75	13.00	10.00
Carwheels, Philadelphia..	16.50	16.50	17.00	11.50
Heavy steel scrap, P'gh...	16.00	16.50	17.25	11.75
Heavy steel scrap, Phila.	16.00	16.00	17.00	11.00
Heavy steel scrap, Ch'go.	15.00	15.50	16.00	9.50
No. 1 cast, Pittsburgh...	16.00	16.00	16.25	12.00
No. 1 cast, Philadelphia..	17.50	17.50	17.50	12.25
No. 1 cast, Ch'go (net ton)	12.00	12.00	12.50	9.00

Coke, Connellsville, Per Net Ton at Oven:

Furnace coke, prompt....	\$2.75	\$2.50	\$2.25	\$1.50
Furnace coke, future....	2.50	2.50	2.50	1.65
Foundry coke, prompt....	3.25	3.25	3.25	2.00
Foundry coke, future....	3.50	3.25	3.25	2.25

Metals,

Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York...	28.25	28.25	29.00	22.50
Electrolytic copper, N. Y.	28.00	28.00	28.50	19.62 1/2
Spelter, St. Louis.....	13.77 1/2	13.75	16.75	26.00
Spelter, New York.....	13.62 1/2	14.00	17.00	26.50
Lead, St. Louis.....	6.85	7.20	7.37 1/2	5.87 1/2
Lead, New York.....	7.00	7.35	7.50	6.00
Tin, New York.....	44.25	46.75	49.75	40.00
Antimony, Asiatic, N. Y..	23.00	25.00	35.00	36.50
Tin plate, 100-lb. box, P'gh	\$5.75	\$5.50	\$5.00	\$3.10

Prices on pig iron, steel and finished material are firm in the absence of new buying, but it is believed that top prices have been reached on practically everything and, with the lull in new buying, there may be slight recessions before long. The local scrap market is badly demoralized, heavy melting steel having been offered as low as \$16; but prices on coke are firm, due to the coal strike. Several contracts for furnace coke have been closed for last half of the year.

Pig Iron.—Local inquiry for Bessemer and basic iron is quiet, but there is a heavy export demand for Bessemer, one inquiry calling for 10,000 tons and another for 5000 tons, both for Italy. The larger inquiry will not be considered by important producers as they prefer to conserve their supply. Sellers of Bessemer iron say they have no trouble in getting \$21 from domestic consumers, and they feel they should get \$21.50 or higher for export. We note a sale of 1000 tons of standard Bessemer iron for export at \$21.50, Valley furnace. The situation in Bessemer iron is tight, and very little is available for prompt delivery. The supply of basic iron is larger than that of Bessemer, and several fairly heavy sales have been made at \$18 and \$18.25, Valley furnace. Southern foundry iron is being offered in the Pittsburgh district as low as \$14, Birmingham, equal to \$18.55, Pittsburgh. This competition is being felt by Valley foundry iron, on which prices are only fairly firm. Resale foundry iron is still being offered in this market on the basis of \$18 to \$18.25, Valley furnace, but some furnaces are holding No. 2 foundry firm at \$18.50, Valley furnace. W. P. Snyder & Co. report the average price on Bessemer iron in May to have been \$20.83 at Valley furnace, an increase over April of 13c., and on basic \$18.16 at Valley furnace, an increase over April of 16c. We quote Bessemer iron at \$21; basic, \$18; gray forge, \$17.75 to \$18; No. 2 foundry, \$18 to \$18.50, and malleable Bessemer, \$18.50 to \$19, all at Valley furnace, the freight rate to the Pittsburgh or Cleveland district being 95c. per gross ton.

Billets and Sheet Bars.—An authority in the trade estimates that there are 150,000 tons or more of rejected shell steel in the form of ingots and slabs offered in this market, and sales of such steel have been made all the way from \$30 to \$42 per ton. The prices ob-

tained depend entirely on the quantity of steel offered, the form it is in and whether it is suitable for use by the intending purchaser. For users of ordinary soft Bessemer and open-hearth steel this rejected steel would not be of service, but the fact that such large quantities are being offered is having the effect of easing up the general market on open-hearth steel. An export inquiry is in the market for 10,000 tons of 9 to 10 in. square ingots, 4 1/2 to 5 ft. long, for shipment to Italy, this being rerolling steel. There has been more domestic inquiry for steel in the past week, and prices on soft open-hearth billets and bars range from \$40 to \$45 per ton at mill. A large amount of new capacity in open-hearth steel has come in the market lately, and deliveries to consumers are better than for some time. We quote soft open-hearth billets and sheet bars at \$42 to \$43; Bessemer billets, \$45; Bessemer sheet bars, \$45, maker's mill, Pittsburgh or Youngstown district. We quote forging billets at \$69 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take \$1 extra.

Ferroalloys.—Inquiry for ferromanganese for prompt shipment is quiet, and fears of a shortage in supply have about disappeared. Sales of carload lots of 80 per cent domestic ferromanganese for prompt shipment are reported at \$250 to \$300 per ton. It is said some contracts for English 80 per cent ferromanganese for delivery in first half of 1917 have been made on the basis of \$175, seaboard, but without guarantee as to deliveries. Domestic 80 per cent ferromanganese in large lots, running 500 tons and over, is offered at about \$200, seaboard, and in small lots \$225 to \$250. Spiegeleisen, running 18 to 22 per cent, is offered at about \$55, and 25 to 35 per cent at about \$60 per ton at furnace. One furnace making Bessemer ferrosilicon has been cutting regular prices about \$2 per ton for delivery over remainder of the year. We quote 50 per cent ferrosilicon at \$85 for lots up to 100 tons, over 100 tons and up to 600 tons, \$84, and over 600 tons, \$83, all per gross ton, f.o.b. Pittsburgh. Prices of Bessemer ferrosilicon for delivery over remainder of the year are now quoted as follows: 9 per cent, \$32; 10 per cent, \$33; 11 per cent, \$34; 12 per cent, \$35; 13 per cent, \$36.50; 14 per cent, \$38.50; 15 per cent,

\$40.50, and 16 per cent, \$43. Seven per cent silvery for the same delivery is \$28.50; 8 per cent, \$29; 9 per cent, \$29.50; 10 per cent, \$30; 11 per cent, \$31, and 12 per cent, \$32. All these prices are f.o.b. at furnace, Jackson or New Straitsville, Ohio, or Ashland, Ky.; each of these points having a freight rate of \$2 per gross ton to Pittsburgh.

Steel Rails.—Only small lots of standard section rails are being placed, but it is of interest to note that the Carnegie Steel Company has its entire output of standard sections sold up through third quarter of 1917 and has already in hand specifications for most of the contracts for these rails. The new demand for light rails from the coal-mining and lumber interests is fairly heavy, but from the traction companies is light. New orders and specifications for light rails in the past week were about 4000 tons. We quote light rails as follows: 25 to 45 lb. sections, 2.10c.; 16 and 20 lb., 2.15c.; 12 and 14 lb., 2.20c., and 8 and 10 lb., 2.25c., in carloads and up to 100 tons. An advance of 5c. per 100 lb. is charged for less than carloads and down to 3 tons, while under 3 tons an additional 5c. is charged. We quote standard section rails of Bessemer stock at 1.47½c., and open-hearth steel, 1.56½c., Pittsburgh.

Plates.—An item of interest is that the Pennsylvania Railroad for its Lines East is in the market for 5000 70-ton steel gondola cars, and the Virginian Railway is reported in the market for 1500 50-ton steel gondola cars. The latter road has just ordered experimentally four steel coal cars of 120 tons capacity each, the order for one car each having been placed with the Standard Steel Car Company, Cambria Steel Company, Pressed Steel Car Company and Virginia Bridge & Iron Works. The Pressed Steel Car Company has taken 15 express cars for the Seaboard Air Line. The mill price on ¼-in. and heavier steel plates is 2.75c. for delivery in last quarter of 1916 and first quarter of 1917. For shipment in six to eight weeks mills quote 3.50c. to 4c., and sales are being made at these prices. Two of the leading plate mills are sold out for this year and are taking orders for first quarter of next year at 2.75c. at mill.

Structural Material.—A large producer outside this district is understood to be offering steel shapes for delivery in four to six weeks at 3.50c. to 4c. at mill, and has taken some orders at these prices. A local interest has taken 1000 tons of steel for bridge work for a prominent road, but new inquiry in the past week has been quiet. Two local fabricators are bidding on about 75,000 tons of shapes for work in New York City. We quote beams and channels up to 15 in. at 2.50c. to 2.75c. at mill for delivery in third and fourth quarters, while small lots from stock are held at 3.25c. up to 4c., prices depending entirely on the size of the order and how soon deliveries are wanted.

Sheets.—The new demand for light black and galvanized sheets is quiet, and in some sections there is more desire on the part of the mills to sell. On blue annealed, electrical and other special sheets prices are strong, with the mills practically sold up for the remainder of this year. Prices on galvanized sheets are weak, but most mills are not trying to sell, preferring to put the steel into other grades of sheets on which there is more profit. A large contract for blue annealed sheets, running from July 1 for an entire year, is said to have been closed lately at about 3.25c. at mill. We quote blue annealed sheets, Nos. 9 and 10 gage, at 3c. to 3.25c., some mills quoting as high as 3.50c. We quote No. 28 Bessemer black sheets at 2.90c. to 3c., and open-hearth, 3c. to 3.10c.; No. 28 galvanized Bessemer stock, 4.75c. to 4.85c., and open-hearth, 4.90c. to 5c. We quote Nos. 22 and 24 black plate, tin mill sizes, H. R. and A., 2.70c.; Nos. 25, 26 and 27, 2.75c.; No. 28, 2.85c.; No. 29, 2.95c., and No. 30, 3c. These prices are for carload and larger lots, f.o.b. mill, Pittsburgh.

Tin Plate.—The domestic market on tin plate is close to \$6 per base box, with the supply light for delivery over the remainder of this year. In fact, three or four of the largest makers say they have their entire output sold up for the remainder of the year, and cannot sell any more at any price. A sale is reported of 8000 boxes for export at close to \$6.50 at mill. We now quote from stock at \$5.75 to \$6, and for export, \$6.25

to \$6.50, per base box, at mill. Prices onterne plate are higher, and we quote 8-lb. coated ternes at \$8.50 to \$8.75 for 200 lb., and \$8.75 to \$9 for 214 lb., all f.o.b. at maker's mill.

Cold-Rolled Strip Steel.—Additional contracts have been placed for delivery in last half of the year at \$6 base per 100 lb., and we also note small lots for delivery in three to four months at \$6.50 to \$6.75. Makers cannot possibly make deliveries on new orders before the last quarter of this year, several stating they have their output practically sold up for the entire year. Extras, standard with all the mills, were printed in full on page 810 in the March 30 issue of THE IRON AGE.

Skelp.—The two or three local makers have their output sold up for the remainder of this year. The Jones & Laughlin Steel Company expects to be rolling skelp in its new mills at Woodlawn, Pa., in August or September, and will likely be making pipe about Oct. 1. Prices are very firm. We quote grooved steel skelp at 2.35c. to 2.40c.; sheared steel skelp, 2.45c. to 2.50c.; grooved iron skelp, 2.70c. to 2.80c., and sheared iron skelp, 3c. to 3.10c., all delivered to consumers' mills in the Pittsburgh district.

Railroad Spikes.—The Boston & Maine Railroad has an inquiry in the market for 10,000 kegs of spikes for 1917 delivery. New buying has been light for some time, and prices are only fairly strong, one or two makers quoting at slightly less than what are regarded as regular prices. We quote:

Standard railroad spikes, 4½ x 9/16 in. and larger, \$2.65 to \$2.75; railroad spikes, ½ and 7/16 in., \$2.75 base; railroad spikes, ¾ in. and 5/16 in., \$3.05 base; boat spikes, \$2.80 base, all per 100 lb., f.o.b. Pittsburgh.

Nuts and Bolts.—The new demand is only fairly heavy, as consumers are covered over the remainder of this year and makers are sold up for the same period. Export inquiry is fairly active and prices are firm. Discounts in effect from May 19, which the makers state are for prompt acceptance only, are as follows, delivered in lots of 300 lb. or more where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50; large, 40.

Machine bolts, h.p. nuts, small, rolled thread, 50, 10 and 5 per cent; small, cut thread, 50 and 5; large, 40 and 10.

Machine bolts, c.p.c. and t. nuts, small, 40, 10 and 5 per cent; large, 35 and 5.

Blank bolts, 40 and 10 per cent; bolt ends, with h.p. nuts, 40 and 10; with c.p. nuts, 35 and 5. Rough stud bolts, 15. Lag screws (cone or gimlet point), 50 and 10.

Forged set screws and tap bolts, 10 per cent. Cut and round point set screws, case hardened, 60. Square and hexagon head cap screws, 55. Flat, button, round or fillister head cap screws, 30.

Nuts, h.p. sq., tapped or blank, \$2.90 off list; hex., \$2.90 off; c.p.c. and t. sq. tapped or blank, \$2.60 off; hex., \$3 off; semi-finished hex., 60 and 10 per cent; finished and case hardened, 60 and 10.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 10 per cent.

Wire Rods.—Export inquiries for wire rods are very heavy, and it is said amount at present to 25,000 to 30,000 tons. Local makers are not selling for export, as they are filled up on all they can make for their regular customers and for their own needs for practically the remainder of the year. A wide range in prices is being quoted. For soft Bessemer, open-hearth and chain rods, prices are all the way from \$55 or less up to \$65 per ton, f.o.b. Pittsburgh.

Wire Products.—The new demand is only fairly heavy, consumers of wire and wire nails being covered for the next two or three months. Specifications against contracts are reported as coming in quite freely. One mill that has no wire or wire nails to offer for delivery before last quarter of this year is quoting \$2.60 and as high as \$2.70 on wire nails, and is said to have taken business at those prices. Regular prices in effect from May 1 are as follows: Wire nails, \$2.50 to \$2.60 per keg; galvanized, 1 in. and longer, taking an advance over this price of \$2, and shorter than 1 in., \$2.50. Plain annealed wire, \$2.45 per 100 lb.; gal-

vanized wire, \$3.15; galvanized barb wire and fence staples, \$3.35; painted barb wire, \$2.65; polished fence staples, \$2.65; cement coated nails, \$2.50, base, all f.o.b. Pittsburgh, with freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing are now 61½ per cent off list for carload lots, 60½ per cent for 1000-rod lots and 59½ per cent for small lots, f.o.b. Pittsburgh.

Iron and Steel Bars.—Contracts from large consumers of steel bars for delivery in the last quarter of this year and first quarter of 1917 are said to have been made at 2.50c. at mill. Implement makers are now trying to cover on their needs for first half of next year and on such business the mills are reported quoting 2.50c. and higher at mill. Heavy inquiries are in the market for steel rounds for shrapnel, but local mills, aside from one producer, are not figuring actively on these, as they do not have the steel to spare. The new demand for iron bars is fair, most consumers being covered for four or five months. We quote steel bars at 2.50c. to 2.75c. at mill for delivery at convenience of the seller, which would not be before last quarter of 1916 or first quarter of 1917. Small lots for fairly prompt shipment bring 3c. to 3.25c. at mill. We quote refined iron bars at 2.60c. to 2.65c., and railroad test bars, 2.70c. to 2.80c. at mill.

Rivets.—The new demand is fairly active, but consumers are covered over the remainder of this year and makers of rivets report they are sold up on practically all they can make for the same period. There is some export inquiry. Several shipments to India and South America of three or four carloads have recently been made by local makers. We quote buttonhead structural rivets, ½ in. in diameter and larger, at \$4 per 100 lb., base, and conehead boiler rivets, same sizes, \$4.10 per 100 lb., base, f.o.b. Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

Shafting.—There is not much new buying, as consumers are covered for months ahead and makers have their output sold up for the remainder of the year. Several contracts for shafting for last quarter have been made at 20 and also at 15 per cent off list. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots for delivery in last quarter of this year and first quarter of 1917, and 10 per cent off in less than carload lots, f.o.b. Pittsburgh, freight added to point of delivery.

Hoops and Bands.—For delivery at convenience of the mill, we quote hoops and bands at 2.50c. to 2.75c., with extras on the latter as per the steel bar card, while for reasonably prompt shipment 2.75c. to 3c. is quoted. As most consumers are covered over the remainder of the year, there is little new buying but specifications against contracts are reported heavy.

Cotton Ties.—No price has yet been fixed for this season, and this may not be done for two or three weeks. It is believed the price will be close to \$1.25 per bundle, against 85c. last year.

Merchant Steel.—Several mills report that their output and shipments in May were heavier than in any one previous month, and they are slowly catching up on back orders, but are still behind in shipments 10 to 12 weeks or longer. Consumers are well covered for the remainder of the year and only small lots are being sold, on which prices for indefinite delivery are about as follows: Iron-finished tire, ½ x 1½ in. and larger, 2.35c., base; under ½ x 1½ in., 2.50c.; planished tire, 2.55c.; channel tire, ¾ to 1 in., 2.85c. to 2.95c.; 1½ in. and larger, 3.25c.; toe chalk, 2.95c. to 3.05c., base; flat sleigh shoe, 2.70c.; concave and convex, 2.75c.; cutter shoe, tapered or bent, 3.25c. to 3.35c.; spring steel, 2.95c. to 3.05c.; machinery steel, smooth finish, 2.75c.

Wrought Pipe.—Iron and steel oil country goods have been advanced from \$4 to \$5 per ton, this applying on oil and gas line pipe, drive pipe and tubing, up to 2 in. in diameter. No changes have been made in prices of standard iron and steel pipe, but the market is firm. The demand for material from the oil and gas fields is very heavy and also for standard pipe. Most mills are sold up for three or four months and on some sizes

of lap weld pipe for practically the remainder of the year. Discounts now in effect on black and galvanized iron and steel pipe are printed on another page.

Boiler Tubes.—On iron and steel tubes makers are sold up for practically the remainder of the year and consumers are covered for the same period, so that new buying is light. Prices are firm. Discounts on iron and steel tubes are given on another page.

Coke.—July 1 is close at hand, and as a result users of blast-furnace coke that have not covered for last half of the year are taking more interest in the market and negotiations are on involving large quantities for shipment over the last half of the year. One leading consumer is reported to have contracted for upward of 25,000 tons of furnace coke that has a very high reputation for quality at about \$2.65 per net ton at oven. Another contract, for about 15,000 tons per month for last half of the year, has also been placed. Most producers of high-grade furnace coke are holding it at \$2.75 per net ton for last half, but this price might be slightly shaded for desirable business. Reports are that the coal miners are going back to work in a few days, but this is not verified. The report, however, had the effect of slightly weakening prices on furnace coke for spot shipment, but this has again given way to decided strength. We quote best grades of furnace coke for prompt shipment at \$2.75 at oven, and note a sale of 75 cars, or close to 2500 tons, at this advanced price. We quote best grades of foundry coke for spot shipment at \$3 to \$3.25, and on contract for last half of the year \$3.25 to \$3.50 per net ton at oven. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended May 27 as 426,812 net tons, an increase over the previous week of 2371 tons.

Old Material.—The local scrap market is badly demoralized, largely due to the fact that a leading consumer that bought heavy steel scrap very largely several months ago is now rejecting great quantities, which are being offered on the market at practically any prices that can be obtained for it. It is said that much of the scrap being shipped to this consumer for some time has not been up to the standard required, and that 700 cars or more have been rejected. Local consumers are not buying, the only sales for some little time having been made in the Youngstown and Sharon districts. Under present conditions, prices of scrap are largely nominal. Heavy steel scrap, it is claimed, of inferior grade has been offered at \$16, but high-grade steel scrap would probably bring \$16.50 to \$17. We note a sale of 200 tons of low phosphorus melting stock at \$20.50, delivered. Dealers quote for delivery in the Pittsburgh and nearby districts that take the same rates of freight, per gross ton, as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	\$16.00 to \$16.50
No. 1 foundry cast	16.00 to 16.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	16.50 to 16.75
Hydraulic compressed sheet scrap	15.00 to 15.50
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	13.00 to 13.25
Bundled sheet stamping scrap	12.00 to 12.25
No. 1 railroad malleable stock	14.25 to 14.50
Railroad grate bars	12.00 to 12.25
Low phosphorus melting stock	20.50
Iron car axles	25.50 to 26.00
Steel car axles	18.00 to 18.50
Locomotive axles, steel	28.00 to 28.50
No. 1 bushing scrap	13.50 to 14.00
Machine-shop turnings	9.25
Old carwheels	15.00 to 15.25
Cast-iron borings	9.25
*Sheet bar crop ends	18.50 to 18.75
No. 1 railroad wrought scrap	19.25 to 19.50
Heavy steel axle turnings	12.00 to 12.25
Heavy breakable cast scrap	14.00 to 14.50

*Shipping point.

The Harbison-Walker Refractories Company has installed a large rotary kiln at its plant at Chester, Pa., for calcining raw magnesite. Previous to the war this material was imported already calcined, but now the company is receiving from Greece large quantities, the bulk of the amount it uses, in the raw or unburned condition, necessitating calcining here.

Chicago

CHICAGO, ILL., June 7, 1916.—(By Wire.)

The largest producer again broke its record for monthly production and shipments, its output in May having been over 400,000 tons. This is practically one-third more than the production upon which sales estimates were made some months ago. In this performance, which has been aided, through several months, by the receipt of steel from Duluth to the amount of about 25,000 tons per month, the leading interest is paralleled in less degree by the majority of mills, yet it is now apparent that a great deal of steel ordered some time ago on the expectation of three, four, five or six months' delivery will not be forthcoming on that schedule. The oversold condition of the mills promises to be more pointedly in evidence in the remainder of the year than it has been up to this time, and matters will not be helped by the fact that consumers have not always specified promptly, and the mills, to keep their operations balanced, have been taking additional business that has offered under favorable conditions of specifications and price. A refutation of reports of easier conditions is also had in the placing last week of a total of nearly 20,000 tons of the heavier steel products, largely bars, on the basis of 2.50c., Pittsburgh, for deliveries at mill convenience through next winter. These purchases are understood to have been made by large buyers who had been previously unable to secure material sufficient to meet orders on their books.

Little further progress has been made by the implement interests in getting under cover for first half. The fact that some of the largest interests who bought very heavily in anticipation of the advancing market will carry over considerable quantities of bars and are therefore showing little concern, coupled with the unassailable position of the mills on the basis of the 2.50c. price, appears to be retarding negotiations. In contrast, some additional mills are taking contracts for first half structural shapes, specifications to be entered during the last half. Forging billets in large quantity were sold last week at \$60 base, and another inquiry for 10,000 tons of low carbon billets on which similar prices were quoted is noted. The Duluth mill is now operating its finishing mills and has discontinued shipment of steel to Chicago. The pig-iron market is exceedingly quiet, as is the old material market also, prices for the latter having suffered another decline of approximately 50c. per ton.

Pig Iron.—Inquiry for pig iron of all grades has shrunk in volume to proportions as restricted as the leanest experiences of this market. From the standpoint of the producers, this unsatisfactory condition is augmented by the holding up of shipments by foundries whose operations are curtailed because of labor difficulties, while at the same time the outlook is brightened in the promise of renewed buying to cover the excellent orders on the books of the melters. Northern furnaces are sufficiently fortified in their future sales not to be disturbed in their views as to prices thus far, but the willingness of Southern interests to sell into this territory at prices which will take whatever business does appear, coupled with the disarrangement of shipping schedules by reason of requests for postponement, is being observed with some concern. On Southern iron, \$14.75 for No. 2 at Birmingham can be done and for spot shipment iron as well, with \$15 the going price for last half delivery. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of \$1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5.....	\$19.75
Lake Superior charcoal, No. 1.....	20.25
Lake Superior charcoal, No. 6 and Scotch....	20.75
Northern coke foundry, No. 1.....	19.50
Northern coke foundry, No. 2.....	19.00
Northern coke foundry, No. 3.....	18.50
Southern coke, No. 1 f'dry and 1 soft.....	\$19.25 to 19.75
Southern coke, No. 2 f'dry and 2 soft.....	18.75 to 19.00
Malleable Bessemer.....	19.50
Basic.....	19.00 to 19.50
Low phosphorus.....	34.00 to 36.00
Silvery, 8 per cent.....	31.50
Bessemer ferrosilicon, 10 per cent.....	33.50 to 35.00

(By Mail)

Rails and Track Supplies.—Railroad buying has been a negligible factor in the week's activity. It is interesting, however, that such buying as has already been done is admittedly far short of what will be necessary to cover the extension work planned. Quotations are as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, \$50, f.o.b. mill, net ton; standard section, Bessemer rails, Chicago, \$33, base; open hearth, \$35; light rails, 25 to 45 lb., \$40; 16 to 20 lb., \$41; 12 lb., \$42; 8 lb., \$43; angle bars, 2c., Chicago.

Structural Material.—Those mills which had reserved space for the rolling of structural steel for their trade during the winter of 1916-17 are now taking contracts for rollings in that general period with the stipulation that specifications must be in, in full, before the close of the last half. As yet no great quantity of material has been booked, nor is the tonnage likely to run to large figures. It is already apparent that mills, generally speaking, will run behind their delivery promises, and the third quarter seems likely to bring increased inconvenience to those who have been awaiting steel. New contracts for fabricated material naturally continue very few. The Texas Company, Port Arthur, Tex., has bought 600 tons of I-beams, columns and trusses and the Merchants Central Heating Company, Spokane, Wash., 250 tons for a heating station. We quote for Chicago delivery of structural steel from mill 2.689c.

We quote for Chicago delivery of structural steel from jobbers' stock 3.10c.

Plates.—The buying of plates for miscellaneous purposes is not in large volume though continuous, yet it outruns the available supply. For third quarter delivery the mills catering to prompt requirements are getting 3.75c. to 4c., Pittsburgh, without great difficulty. We quote for Chicago delivery of plates from mill on contracts 3.089c. and for prompt shipment 3.939c. to 4.189c.

We quote for Chicago delivery of plates out of jobbers' stock 3.50c.

Sheets.—Inquiry for sheets in heavy gages continues plentiful and persistent. One day's inquiry received by a single interest totaled 1400 tons, while a smaller mill took 500 tons in the week. Demand is largely from the railroads, tank builders and the general manufacturing trade. As contrasted with the prices for this grade of sheets, ranging from 3.15c. to 3.25c., Pittsburgh, the quotations for one-pass sheets on the basis of 2.75c. for No. 28 speak for themselves of the unusual situation that obtains. For these lighter gages 2.85c. is the common price and 2.75c. has been done on more attractive business. The decline in spelter, while it has been followed by somewhat lower prices for galvanized sheets, 4.75c., Pittsburgh, having been done, has brought out little business, because of the expectation of still lower quotations. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.089c. to 3.339c.; box annealed, No. 17 and lighter, 2.939c. to 3.039c.; No. 28 galvanized, 4.939c. to 5.039c.

We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.10c. to 3.20c.; No. 28 galvanized, 5.40c. to 5.50c.

Bars.—Some business in iron bars is reported for the week on the basis of 2.45c. and 2.50c., Chicago, for third quarter delivery, shipments for this month still taking the 2.35c. price. The week also brought out large purchases of steel bars for delivery at mill convenience in the first quarter on the basis of 2.50c., Pittsburgh, purchases representing added requirements of large buyers who had been unable to secure as much tonnage as desired for the last half. Demand for bars for reinforcing purposes is not as heavy as it has been, and there is still some evidence of the selling of deformed bars at more favorable prices than obtain for plain material from mill, a condition understood to represent the taking of profits by the manufacturers of special bars on low-priced contracts, soon to expire. An inquiry for 1000 tons of reinforcing steel for St. Paul delivery is noted. We quote, mill shipment, Chicago, as

follows: Bar iron, minimum, 2.35c. to 2.50c.; soft steel bars, 2.689c.; nominal on contracts, 3.18c. for prompt shipment; hard steel bars, 2.50c. to 2.75c.; shafting, in carloads, 20 per cent off; less carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.10c.; bar iron, 3.10c.; reinforcing bars, 3.10c., base with 5c. extra for twisting in sizes $\frac{1}{2}$ in. and over and usual card extras for smaller sizes; shafting 10 per cent above list.

Rivets and Bolts.—The selling of rivets was active last week, one interest recording sales of 2000 tons, the business going on the basis of 3.75c., Pittsburgh. Specifications for bolts and nuts are being received in good volume, but there is little contracting at the recent advance in prices, that level being as yet largely nominal. We quote carriage bolts up to $\frac{3}{4}$ x 6 in., rolled thread, 50-10-5; cut thread, 50-5; larger sizes, 40-5; machine bolts up to $\frac{3}{4}$ x 4 in., rolled thread, with hot pressed square nuts, 50-10-10; cut thread, 50-10; larger sizes, 40-10-5; gimlet point coach screws, 60; hot pressed nuts, square, \$2.90 off per 100 lb.; hexagon, \$2.90 off. Structural rivets, $\frac{3}{4}$ to 1 $\frac{1}{4}$ in., 3.50c. to 3.75c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 3.50c.; boiler rivets, 3.60c.; machine bolts up to $\frac{3}{4}$ x 4 in., 60-10; larger sizes, 50-10; carriage bolts up to $\frac{3}{4}$ x 6 in., 60-5; larger sizes, 50 off; hot pressed nuts, square, \$3.25, and hexagon, \$3.25 off per 100 lb., lag screws, 65.

Wire Products.—Conditions in the wire trade are following a routine which affords little occasion for comment. The demand, where new inquiry appears, is most largely for plain wire and wire nails. We quote as follows: Plain wire, No. 8 and coarser, base, \$2.639; wire nails, \$2.689; painted barb wire, \$2.839; galvanized barb wire, \$3.539; polished staples, \$2.839; galvanized staples, \$3.539, all Chicago.

Old Material.—Buyers of scrap appear to be able to limit their purchases to the buying of only what may be offered under the necessity of selling, and in consequence their offers are lower following each transaction. The supply of locomotive tires appears limited, as a sale was made by a railroad at an advance over last week, although another lot went at \$19.25. Iron rails were bought last week at \$19. In a number of other transactions the prices secured by the railroads are approximately those at which dealers are turning over the materials to consumers, so rapidly has the market been weakening. The general level of prices has declined nearly 50c. per ton. While some of the railroads are disposed to withhold their scrap from the market in the hope of an upward turn, offerings this week do not evidence any general policy in this direction. The Santa Fe has 1500 tons; the Soo Line, 1000 tons; Chicago & Alton, 800 tons; the Wabash, an unusually large list of 6000 tons, including 1600 tons of wheels and 1300 tons of wrought scrap, and the Pennsylvania Lines a large list. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton	
Old iron rails	\$18.50 to \$19.00
Relaying rails	19.50 to 20.50
Old carwheels	12.75
Old steel rails, rerolling	16.75 to 17.25
Old steel rails, less than 3 ft.	16.50 to 17.00
Heavy melting steel scrap	15.00 to 15.50
Frogs, switches and guards, cut apart	15.00 to 15.50
Shoveling steel	14.00 to 14.50
Steel axle turnings	10.00 to 10.50

Per Net Ton	
Iron angles and splice bars	\$18.25 to \$18.75
Iron arch bars and transoms	19.50 to 20.00
Steel angle bars	14.50 to 14.75
Iron car axles	23.25 to 23.75
Steel car axles	22.75 to 23.25
No. 1 railroad wrought	15.50 to 16.00
No. 2 railroad wrought	14.00 to 14.25
Cut forge	14.25 to 14.50
Pipes and flues	11.00 to 11.50
No. 1 busheling	12.50 to 12.75
No. 2 busheling	8.50 to 8.75
Steel knuckles and couplers	15.00 to 15.25
Steel springs	15.75 to 16.00
No. 1 boilers, cut to sheets and rings	9.75 to 10.25
Boiler punchings	14.00 to 14.50
Locomotive tires, smooth	19.25 to 19.75
Machine shop turnings	5.75 to 6.25
Cast borings	5.75 to 6.25
No. 1 cast scrap	12.00 to 12.25
Stove plate and light cast scrap	10.00 to 10.50
Grate bars	10.25 to 10.50
Brake shoes	10.00 to 10.50
Railroad malleable	12.00 to 12.50
Agricultural malleable	10.75 to 11.25

Cast-Iron Pipe.—At St. Paul, Minn., bids are being received on 1100 tons; at Waukegan, Ill., on 440 tons, and at Sheboygan Falls, Wis., on 370 tons. At Morris, Minn., a contract was placed with the leading interest for 200 tons. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$33.50 to \$34; 6 in. and larger, \$30.50 to \$31, with \$1 extra for class A water pipe and gas pipe.

Philadelphia

PHILADELPHIA, PA., June 6, 1916.

Current demand for some steel products, notably structural shapes, is lighter, but the mills are far from being free of distress in making deliveries. Plates are as active as ever, and makers are still apportioning deliveries among their customers. Prices show little impairment. Foreign demand for steel and for pig iron is surging in stronger than ever, and despite high ocean freights a larger business would be done were it not for the desirability of caring for home consumers. Not only are producers glad to avoid the intricacies of the export trade, but they also have an eye on supplying domestic consumers who can be counted on for repeat orders. Foundry pig iron is dull, and expected to remain so for a few weeks. Scattered lots have been placed at concessions in price. The feature of the week has been continued discussion of the buying of basic by the Maryland Steel Company. Over 10,000 tons is known to have been supplied at a low price by an eastern Pennsylvania steel company. The future of the ore supply is attracting attention, some authorities holding that a shortage in the latter part of this year is inevitable. Ferromanganese is in good supply and easier. Coke shows more strength and its future is rendered uncertain because of labor troubles in the coal fields. The old material market is stagnant.

Pig Iron.—A great deal of conjecture, with few facts, has been going the rounds of the trade in the past week in regard to the purchase of several thousand tons of basic by the Maryland Steel Company. It can be said, if not authoritatively, that upward of 10,000 tons was sold to the purchasing company by an eastern Pennsylvania steel company, and that the price was low, though how far below the recent market is not stated. Other lots are understood to have been taken also, and the buying is not yet concluded. It has been inferred that delivery would be at Sparrows Point, but it is possible that some of the iron will go to the Bethlehem Steel Company or to some of its customers. It is not long since the Bethlehem Steel Company bought iron to fill some of its contracts with basic consumers. Foundry iron has been extremely dull, with few inquiries, and these scattered. Odd lots have been offered at concessions. There have been some sales, and \$20.25 to \$20.75 about represents the range of eastern Pennsylvania No. 2 X. Some of the trade believe the present dullness will last until well into July. Should there develop a market for spot iron, it is conceded that prices will advance quickly. Already there is a shortage of steel-making iron, which is not surprising in view of the enormous consumption. From Italy, France, England and Japan inquiry is heavy for special Bessemer and malleable, and some good sales of washed metal have been made for export. Special Bessemer for export has been quoted at \$26.26, New York, and malleable at \$20.75, New York. British consumers continue to inquire for iron that approximates their hematite, the price of which a recent cable put at £7 2s. 6d. Producers of standard low-phosphorus are principally engaged in making deliveries. Their quotation is unchanged at \$34 to \$35, Philadelphia. Lebanon low-phosphorus is quiet at \$30 to \$32, furnace, the makers being well sold up. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa., No. 2 X foundry	\$20.25 to \$20.75
Eastern Pa., No. 2 plain	20.00 to 20.50
Virginia, No. 2 X foundry	21.25
Virginia, No. 2 plain	20.75
Gray forge	19.50
Basic	20.00 to 20.50
Standard low phosphorus	34.00 to 35.00

Iron Ore.—Arrivals at this port in the week ended

June 3 consisted of 4940 tons from Chile and 1675 tons from Spain. Those who look into the future are giving thought to the possibility of a shortage of ore in the latter part of this year, pointing out that not only will the Lake boats be inadequate to supply the necessary transportation, but that a shortage of railroad cars is more than likely, something regarded as of equal importance. Business in foreign ore continues dormant.

Ferroalloys.—No change is reported, the sellers of English 80 per cent ferromanganese continuing to quote \$200, seaboard, for the last quarter, and \$175 for the first quarter. The availability of prompt material from domestic furnaces and liberal arrivals from abroad are held accountable for offerings of prompt at \$250. It is felt that less than that figure would be accepted. In the week 200 tons of 80 per cent ferromanganese arrived here from England. Contract ferrosilicon, 50 per cent, is unchanged at \$83 to \$85, Pittsburgh, according to quantity; 10 per cent is quoted at \$34.44, delivered, and 11 per cent at \$35.44.

Plates.—The chief trouble a leading mill encounters is in appeasing the demands of importunate customers who want about twice as much as can be given to them, not a new trouble, by any means. Even with drastic cutting of apportionments the booked tonnage is not diminishing to an appreciable extent. The mill in question quotes 4.159c., Philadelphia, and is making contracts for the third quarter, and to a less extent into the fourth, on that basis. Other makers continue to quote 4.159c., but one, whose sizes are limited, quotes a minimum of 3.909c., Philadelphia. More mills are adopting "pressing steel" as a new classification, and rearranging their extras as heretofore mentioned in THE IRON AGE.

Bars.—The nominal quotation for steel bars is 3.159c., Philadelphia, but where prompt deliveries are concerned up to 3.659c., Philadelphia, has been asked. Where 2.659c. is quoted, it is purely nominal. Iron bars are strong, though the market is slightly quieter at 2.659c., Philadelphia, carload lots. The leading eastern maker of steel rounds is filled up for the year.

Structural Material.—Current business is lighter, and no new propositions of importance are mentioned, but the mills have no less difficulty in filling orders. On third quarter deliveries they quote 3.159c., Philadelphia. Where lower quotations are made indefinite deliveries are involved.

Billets.—Sales of open-hearth rerolling billets continue to be made at \$50, while forging steel is unchanged at \$65. Inquiry is active, especially from foreign sources. The demand for shell-steel discards is practically keeping pace with production.

Sheets.—The leading eastern Pennsylvania maker has been so hampered by strike troubles, now ended, that it cannot take on much new business, although the demand continues good. No. 10 blue annealed is unchanged at 3.909c. to 4.159c., Philadelphia.

Old Material.—Except for the occasional movement of small lots the market continues inactive, and dealers are complaining. Heavy melting steel has sold all the way from \$16 to \$16.75. The embargo situation is no better, and there is a surplus of scrap of all descriptions, with turnings, in particular, a drug on the market. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania, and taking freight rates from 35c. to \$1.35 per gross ton, are as follows:

No. 1 heavy melting steel.....	\$16.00 to \$16.50
Old steel rails, rerolling	18.00 to 19.00
Low phos. heavy melting steel scrap	22.50 to 23.25
Old steel axles	26.00 to 27.00
Old iron axles	28.00 to 29.00
Old iron rails	20.00 to 20.50
Old carwheels	16.50 to 17.00
No. 1 railroad wrought	22.00 to 22.50
Wrought-iron pipe	13.25 to 13.75
No. 1 forge fire	14.50 to 15.00
Bundled sheets	14.50 to 15.00
No. 2 busheling	11.00 to 11.50
Machine shop turnings	9.00 to 9.50
Cast borings	10.00 to 10.50
No. 1 cast	17.50 to 18.00
Grate bars, railroad	13.50 to 14.00
Stove plate	13.00 to 13.50
Railroad malleable	14.50 to 15.00

Coke.—The market is quiet, but stronger. Spot furnace is quoted at \$2.50 to \$2.75 per net ton at oven,

and contract at \$2.50 to \$3.00. Prompt foundry is quoted at \$3.25 to \$3.50, and contract at \$3.50 to \$3.75. Strikes in the coal fields are causing much uncertainty. Freight rates from the principal producing districts are as follows: Connellsville, \$2.05; Latrobe, \$1.85, and Mountain, \$1.65.

Cincinnati

CINCINNATI, OHIO, June 6, 1916 (By Wire).

Pig Iron.—Resale iron in the South is a disturbing factor, and it is reported that as low as \$14.50, Birmingham basis, can be done on some iron that has to be moved promptly, though it is stated that this iron is not up to standard. The majority of furnaces are holding at \$15 for shipment this year and from \$15 to \$15.50 for the first half of next year, and one interest is quoting \$16. Inquiry is lighter than at any time this year, and sales are also proportionately scarce, including only small tonnages for filling in. It is now estimated that less than 25 per cent of foundry iron is yet to be bought in this territory to supply melters' needs for this year. Northern foundry iron is still being held at \$19, Ironton, for any shipment up to July 1, 1917, but resale lots for this year can be obtained at \$18.50. The Southern high silicon irons are quoted extremely low, as compared with the Ohio Jackson county silvery irons, but up to the present time comparatively limited amounts have been sold in competition with the Northern product that is being held at \$27 furnace for an 8 per cent analysis. Local merchants are interested in reported foreign inquiries for basic iron, but no orders for export can be filled from any nearby producing district. A foundry melter in central Ohio has temporarily withdrawn a 1000-ton inquiry for Southern iron for shipment in the first half of next year. Based on freight rates of \$2.90 from Birmingham and \$1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.....	\$18.15 to \$18.65
Southern coke, No. 2 f'dry and 2 soft.....	17.65 to 18.15
Southern coke, No. 3 foundry.....	17.15 to 17.65
Southern coke, No. 4 foundry.....	16.65 to 17.15
Southern gray forge.....	16.15 to 16.65
Ohio silvery, 8 per cent silicon.....	28.26 to 28.76
Southern Ohio coke, No. 1.....	21.26
Southern Ohio coke, No. 2.....	20.26
Southern Ohio coke, No. 3.....	19.76
Southern Ohio malleable Bessemer.....	20.26
Basic, Northern	20.26
Lake Superior charcoal	21.20 to 22.20
Standard Southern carwheel	24.90 to 25.40

(By Mail)

Finished Material.—The mill price of No. 28 galvanized sheets has eased down to 5c. to 5.15c., Cincinnati or Newport, Ky., and No. 28 black sheets are quoted around 3c. to 3.15c. The reduction in spelter is responsible for the present quotation on galvanized sheets. There is a fairly good demand for both black and galvanized sheets, although the mills are not encouraging purchasers to make long-time contracts. Local jobbers are quoting No. 10 blue annealed sheets at 3.50c.; small structural shapes, 3.20c.; wire nails, \$2.75 per keg, base, and barb wire, \$3.60 per 100 lb. The jobbers' discount on the smaller sizes of machine bolts is unchanged at 60 per cent off list, and the larger sizes 40 and 10 and 5 per cent off; carriage bolts, smaller sizes, 50 and 10 and 5 per cent off; larger sizes, 40 and 5 per cent. The mill and foundry supply business is said to be holding up very well.

Coke.—Contracting for foundry coke is almost at a standstill and no furnace coke is needed in this territory for shipment this year. A limited demand is found for 48-hr. coke for domestic use. Spot shipment prices on Connellsville furnace and foundry coke are somewhat soft and furnace coke is quoted around \$2.25 to \$2.50 per net ton at oven for nearby shipment and \$2.50 to \$2.75 for contract business. Foundry coke is unchanged at \$3.25 to \$3.50 per net ton at oven for either prompt or future movement. Both Wise County and Pocahontas producers are asking 25c. per ton more and New River foundry coke is unchanged at \$4 to \$4.25.

Old Material.—The market is very weak, and for some grades of scrap there is practically no demand. Cast borings and steel turnings are now a drug on the market, and some machine shops assert that they are

unable to obtain higher than \$4.50 per net ton for this class of scrap. Selling prices are proportionately low, and there are no indications of any improvement in the near future. The following are dealers' prices to consumers, f.o.b. at yards, southern Ohio and Cincinnati:

Per Gross Ton	
Bundled sheet scrap	\$11.75 to \$12.25
Old iron rails	15.75 to 16.25
Relaying rails, 50 lb. and up	21.25 to 21.75
Revolving steel rails	15.00 to 15.50
Heavy melting steel scrap	14.25 to 14.75
Steel rails for melting	13.50 to 14.00
Per Net Ton	
No. 1 railroad wrought	\$13.50 to \$14.00
Cast borings	5.50 to 6.00
Steel turnings	5.50 to 6.00
Railroad cast scrap	11.25 to 11.75
No. 1 machinery scrap	13.00 to 13.50
Burnt scrap	8.25 to 8.75
Iron axles	20.25 to 20.75
Locomotive tires (smooth inside)	18.00 to 18.50
Pipes and flues	9.75 to 10.25
Malleable and steel scrap	11.00 to 11.50
Railroad tank and sheet scrap	8.75 to 9.25

Buffalo

BUFFALO, N. Y., June 6, 1916.

Pig Iron.—The general market has quieted down still further. Inquiry and sales have been small. Notwithstanding the lack of activity in new buying, however, the price structure is rigid, due to the conviction among producers that there will be a full demand for all the iron that can be produced in this section for months. One of the large producers of the district reports that it has retired absolutely from the market for any deliveries during the remainder of the year on account of a full order book. We quote for current and last half, with deliveries extending into first half of next year, f.o.b. furnace, Buffalo, as follows:

No. 1 foundry	\$19.00 to \$20.00
No. 2 X foundry	18.50 to 19.00
No. 2 plain	18.25 to 18.75
No. 3 foundry	18.25 to 18.75
Gray forge	18.00 to 18.50
Malleable	18.50 to 19.00
Basic	19.00 to 19.50
Bessemer	21.00 to 22.00
Charcoal, regular brands and analysis	21.00 to 22.00

Finished Iron and Steel.—Most mills have sufficient business booked to keep them running full to the end of 1916, and up to the present time are not making sales for next year except for lap-over deliveries on existing contracts taken for shipment at mill's convenience. Consumers, knowing this, and having been getting in material on contracts sufficient to meet current requirements and keep them going, are making little effort to cover for possible requirements in 1917. Bids are soon to be taken on 325 tons of deformed rounds for concrete reinforcement for an addition to the Buffalo Pottery Company's plant. The Union Carbide Company, Niagara Falls, has placed an order with the United States Steel Products Company for 3500 tons of structural steel for a carbide plant at Saute, Norway.

Old Material.—The market is holding to about the same degree of activity as reported last week. The local demand for heavy melting steel is off for the time being, and only small transactions are reported in other lines. While a sagging is noted in the prices of some items of the list, particularly borings, turnings, bundled sheet, busheling scrap, wrought pipe and grate bars, the general impression is that the decline is but temporary and the market is actually stronger than the prevailing schedule would indicate. We quote dealers' asking prices as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	\$16.50 to \$17.00
Low phosphorus steel	20.00 to 20.50
No. 1 railroad wrought scrap	19.00 to 19.50
No. 1 railroad and machinery cast scrap	16.00 to 16.50
Old steel axles	24.00 to 24.50
Old iron axles	24.00 to 24.50
Old carwheels	14.00 to 14.50
Railroad malleable	15.50 to 16.00
Machine shop turnings	7.50 to 8.00
Heavy axle turnings	12.00
Clean cast borings	8.25 to 8.50
Old iron rails	18.00 to 18.50
Locomotive grate bars	11.50 to 12.00
Stove plate (net ton)	11.50 to 12.00
Wrought pipe	13.00 to 13.50
Bundled sheet scrap	12.00 to 12.50
No. 1 busheling	14.00 to 14.50
No. 2 busheling	11.00 to 11.50
Bundled tin scrap	15.00 to 15.50

Cleveland

CLEVELAND, OHIO, June 6, 1916.

Iron Ore.—A new record in the ore movement was set in May, the water shipments from Lake Superior for the month reaching 8,449,580 gross tons. The previous high mark was in July, 1913, when the movement was 8,204,416 tons. The May movement was an increase of 3,437,221 tons over the corresponding movement a year ago. Shipments for the season up to June 1 were 10,107,991 tons, a gain of 4,491,799 tons over the same period last year and an increase of 1,957,392 tons over the movement up to June 1, 1913, which was the banner year in the Lake ore trade. About all of the free vessel capacity is reported to have been chartered at the wild rate of \$1 a ton net from the head of the Lakes, this rate not only being paid for immediate tonnage, but for vessel capacity for several weeks ahead. There is no activity in the market. We quote prices as follows, delivered lower Lake ports: Old range Bessemer, \$4.45; Mesaba Bessemer, \$4.20; Old range non-Bessemer, \$3.70; Mesaba non-Bessemer, \$3.55.

Pig Iron.—Interest in the pig-iron market is now centered in the foreign demand, mostly for Bessemer iron for export to Italy. Eastern furnaces are reported to have sold in the past few days about 25,000 tons of Bessemer for export and a Cleveland interest has quoted \$21 on a round tonnage. Among the export inquiries is one for 1500 tons of foundry iron for Sweden. One domestic basic inquiry for 10,000 tons is pending. There is practically no activity in foundry grades, although some central western foundries have not yet covered for their last half requirements. One leading interest reports that it has no iron of any grade for sale for delivery before November. Local prices are unchanged at \$18.50 for No. 2 for out-of-town shipment and \$19 delivered, Cleveland, and \$18.50 is the general quotation by the Valley furnaces. Southern iron is inactive at \$14.75 to \$15, Birmingham, for No. 2 for this year's delivery and \$15 to \$15.50 for first half. While Ohio silvery iron is quoted at \$27 to \$29 for 8 per cent, these prices can probably be shaded to meet the competition of Tennessee furnaces which are quoting silvery iron on a basis of \$25 to \$26. We quote delivered, Cleveland, as follows:

Bessemer	\$21.95
Basic	\$18.95 to 19.30
Northern No. 2 foundry	19.00 to 19.30
Southern No. 2 foundry	18.75 to 19.50
Gray forge	18.75
Jackson Co. silvery, 8 per cent, silicon	28.62 to 30.62
Standard low phos., Valley furnace	32.00

Coke.—The market is inactive and prices are weak. Considerable foundry coke for prompt shipment is being offered, for which there is little demand. We quote standard Connellsville foundry coke at \$3 to \$3.25 per net ton at oven for prompt shipment and \$3.25 to \$3.50 for last half contracts.

Finished Iron and Steel.—The demand for finished steel has quieted down materially. Consumers seem to be fairly well supplied, so that orders for early shipment show considerable falling off. This is particularly true of plates. Most plate consumers are now covered with contracts. Some makers of boilers for farm purposes are running very light at present, claiming to be unable to sell their products at the advance in price necessitated by the high cost of steel. There is an easing up in some prices for early delivery. Bessemer steel bars for prompt shipment can be had at 2.75c., Pittsburgh, for round lots and the same is true of structural material, although 3c. is the general quotation. Local mills still quote plates at 3.50c. to 4c., Pittsburgh. High speed steel has eased up materially and can be had at \$2.75 per lb. as compared with the recent price of \$3.50. Little new structural work is coming out except in small lots for building purposes. The McClintic-Marshall Company has taken 900 tons for a terminal building for the Northern Ohio Traction & Light Company, in Akron, Ohio, and the Canton Bridge Company has taken the steel for an addition to the plant of the Berger Mfg. Company, Canton, Ohio. There is some inquiry for sheet bars for fourth quar-

ter. Hard steel bars are quoted at about 2.50c., delivered in Ohio territory, and iron bars at 2.50c. to 2.60c., Cleveland. A local mill has taken a heavy volume of business in blue annealed sheets during the past week, but the demand for black and galvanized sheets has fallen off, many consumers feeling that the prices may go lower. We quote black sheets at 2.90c. to 3c., Ohio mill, for No. 28; blue annealed at 3c. to 3.25c., and galvanized at 4.75c. to 4.85c. Warehouse prices are unchanged at 3.25c. for steel bars and structural material; 3.65c. for plates and 3.20c. for iron bars.

Bolts, Nuts and Rivets.—The demand for bolts and nuts continues very heavy. Jobbers are placing contracts for the third quarter at current prices, which are firmly maintained. The demand for rivets continues active, although not as heavy as a few weeks ago. Contracts are being closed for third and fourth quarters. We quote rivets at 4c., Pittsburgh, for structural rivets and 4.10c. for boiler rivets for prompt shipment and third and fourth quarter contracts. Bolt and nut discounts are as follows:

Common carriage bolts, $\frac{3}{8}$ x 6 in., smaller or shorter, rolled thread, 50 and 10; cut thread, 50; larger or longer, 40; machine bolts with h. p. nuts, $\frac{3}{8}$ x 4 in., smaller and shorter, rolled thread, 50, 10 and 5; cut thread, 50 and 5; larger and longer, 40 and 10; lag bolts, gimlet or cone point, 50 and 10; square h. p. nuts, blank or tapped, \$2.90 off the list; hexagon, h. p. nuts, blank or tapped, \$2.90 off; c. p. c. and t. square nuts, blank or tapped, \$2.60; hexagon nuts, all sizes, \$3 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 10.

Old Material.—There is little activity in the market, which continues weak. Mills are not actively in the market but are buying small lots of material offered at low prices. Shipments to mills are very heavy. However, with large tonnages purchased for June and July delivery, an active buying movement is not expected before next month. Malleable scrap is about 50c. a ton lower, and borings and turnings have declined about 25c. Because of the scarcity of labor mills do not want old steel rails that require shearing, and these are also lower. An embargo has been declared against the plant of Corrigan, McKinney & Co. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton	
Old steel rails	\$15.50 to \$16.00
Old iron rails	19.00
Steel car axles	28.00 to 29.00
Heavy melting steel	15.75 to 16.00
Old carwheels	13.50 to 13.75
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	12.50 to 12.75
Railroad malleable	15.50
Steel axle turnings	13.00 to 13.25
Light bundled sheet scrap	13.00 to 13.25
Per Net Ton	
Iron car axles	\$23.00 to \$24.00
Cast borings	7.00 to 7.25
Iron and steel turnings and drillings	7.25 to 7.50
No. 1 busheling	13.50 to 13.75
No. 1 railroad wrought	16.50 to 16.75
No. 1 cast	14.00 to 14.25
Railroad grate bars	11.75 to 12.00
Stove plate	11.25 to 11.50

St. Louis

St. LOUIS, Mo., June 5, 1916.

Pig Iron.—Sales were altogether of the small-lot order. It is quite generally accepted that under conditions of competition for large tonnage there might be a cut in price, probably by holders of resale iron and particularly for early delivery. The water and rail rates continue to have some bearing on the St. Louis territory situation. The saving ranges from 25c. to \$1.20 per ton, according to point of delivery, that at St. Louis city being 60c. per ton.

Coke.—Practically nothing is doing for either immediate or future delivery. The tone, however, is generally firmer. By-product coke is taken as fast as produced locally, and therefore is not bearing the market.

Finished Iron and Steel.—Considerable pressure for delivery on contracts is developing, but there has been no notable change in the buying. In standard section steel rails two inquiries for 550 and 600 tons respectively are pending. Movement out of warehouse is very active still and prices are well held at these figures: Soft steel bars, 3.15c.; iron bars, 3.10c.; structural material, 3.15c.; tank plates, 3.55c.; No. 10 blue annealed

sheets, 3.45c.; No. 28 black sheets, cold rolled, one pass, 3.30c.; No. 28 galvanized sheets, black sheet gage, 5.50c.

Old Material.—Dealers are neither buying nor selling at present, while the consuming interests are continuing to run on their yard supplies. There is still much congestion at the mills, and embargoes are still in effect in most instances. Relaying rails are active and hard to get, with prices ruling very firm as quoted. Lists out include 800 tons from the Chicago & Alton, 250 tons from the Vandalia, 250 tons from the Kansas City Southern, 4000 tons from the Missouri, Kansas & Texas, 700 tons from the Mobile & Ohio, and about 200 tons from the Kansas City Terminal. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton	
Old iron rails	\$16.75 to \$17.25
Old steel rails, re-rolling	15.75 to 16.25
Old steel rails, less than 3 ft.	16.25 to 16.75
Relaying rails, standard section, subject to inspection	22.00 to 23.00
Old carwheels	11.75 to 12.25
No. 1 railroad heavy melting steel scrap	15.75 to 16.25
Heavy shoveling steel	12.50 to 13.00
Frogs, switches and guards cut apart	14.75 to 15.25
Bundled sheet scrap	9.75 to 10.25

Per Net Ton	
Iron angle bars	\$15.75 to \$16.25
Steel angle bars	13.25 to 13.75
Iron car axles	23.25 to 23.75
Steel car axles	24.75 to 25.25
Wrought arch bars and transoms	19.00 to 19.50
No. 1 railroad wrought	15.25 to 15.75
No. 2 railroad wrought	15.00 to 15.50
Railroad springs	13.75 to 14.25
Steel couplers and knuckles	13.75 to 14.25
Locomotive tires, 42 in. and over, smooth inside	18.75 to 19.25
No. 1 dealers' forge	10.25 to 10.75
Mixed borings	6.25 to 6.50
No. 1 busheling	12.75 to 13.25
No. 1 boilers, cut to sheets and rings	9.00 to 9.50
No. 1 railroad cast scrap	11.75 to 12.25
Stove plate and light cast scrap	9.75 to 9.25
Railroad malleable	11.00 to 11.50
Agricultural malleable	10.00 to 10.50
Pipes and flues	10.25 to 10.75
Railroad sheet and tank scrap	9.50 to 10.00
Railroad grate bars	8.75 to 9.25
Machine shop turnings	7.25 to 7.50

Birmingham

BIRMINGHAM, ALA., June 5, 1916.

Pig-Iron.—The Southern pig-iron market has weakened perceptibly. The continued delay in purchase of forward iron, the diminution in volume of business actually transpiring and the desire to begin the more complete filling of last half order books have practically merged spot and forward prices on the \$15 basis, with some resale iron going under that. Furnace interests are not yet openly quoting \$15 for the last half, but large consumers can make selections around that figure and special inducements would, in some instances, carry the same price to 1917 deliveries. The disposition to name one price covering a long period, which found its first expression several weeks ago, when the leading interest named \$15.50 as its basis through the first half of 1917, is becoming more general. One large operator said he would be glad to book to a large percentage of his capacity through the first half of 1917 at \$15. One interest sold 500 tons each for last quarter of 1916 and first quarter of 1917 at \$15.50 to the same customer, and fill-in orders on forward iron have been booked on that basis, but no large transaction at \$15.50 has been noted in some time. There is no evidence of an early buying movement of any consequence. Bookings of basic iron have increased. A tentative plan to put a long idle blast furnace on basic, using nodulized ore, is reported as approaching fruition. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	\$15.50 to \$16.00
No. 2 foundry and soft	15.00 to 15.50
No. 3 foundry	14.50 to 15.00
No. 4 foundry	14.25 to 14.75
Gray forge	14.00 to 14.50
Basic	15.00 to 15.50
Charcoal	22.00 to 22.50

Cast-Iron Pipe.—The market is not as active as a month ago. Rush orders for small quantities featured the week. Foundry operations will continue active unless the lull becomes more pronounced, of which there

is, however, no present indication. The Middle West predominates in the orders. We quote, per net ton, f.o.b. Birmingham pipe shop yards, as follows: 4-in., \$28; 6-in. and upward, \$25, with \$1 added for gas pipe and 16-ft. lengths.

Coal and Coke.—Probably 1,000,000 to 1,500,000 tons of coal is involved in the renewal of old contracts and placing of new ones by the railroads with Birmingham district operators. Several renewals are at 7c. to 10c. per ton advance. In a few instances coal from other States was replaced. The establishment of new rates to lower Mississippi River points by recent enactment of the Interstate Commerce Commission benefits Alabama mines as compared with those of Kentucky, Illinois, etc. Blacksmithing coal brings from \$1.75 in quantities to \$2.25. Coke is extremely active, with no indication of an early let-up in the demand, which exceeds the supply. We quote standard beehive brands, f.o.b. oven, at \$4 to \$4.25 per net ton with some as high as \$4.50.

Old Material.—The scrap market is weak, owing to the large offerings and the care with which stocks are being taken by foundries and mills. Steel scrap is perceptibly softer, and all grades are inclined that way with the exception of wrought. We quote, per gross ton, f.o.b. Birmingham yards, as follows:

Old steel axles	\$24.00 to \$25.00
Old steel rails	11.75 to 12.25
No. 1 steel scrap	10.00 to 10.50
No. 1 wrought scrap	16.00 to 16.50
No. 1 cast scrap	11.00 to 11.50
Extra heavy cast scrap	9.50 to 10.00
Stove plate and light	10.00 to 10.50
Tram carwheels	10.50 to 11.00

New York

NEW YORK, June 7, 1916.

Pig Iron.—The well-sold condition of the pig-iron market and on the other hand its well-bought condition account for the present period of quiet which promises to continue for some weeks. Producers still call attention to the fact that foundry consumption would be greater if labor troubles with machinists and molders were adjusted—a truism which has been applicable to the situation for some months. In general the disturbing possibilities on the labor side are recognized as a probably continuing factor throughout the summer. The present market is not exempt from the easing off of prices which usually comes when pig iron buying is light. There is no weakness to speak of, and yet an occasional foundry buyer, finding a quotation 25c. less than he had a little while ago, feels inclined to wait, even though recognizing that the next quotation may see the former price restored. Some resale iron from Buffalo bought at several dollars a ton below this market has been offered in the East at \$20.50 delivered, which would figure back to a little under \$18 at furnace for No. 2. Buffalo furnaces are not selling at so low a price, however. In New Jersey a few lots have been taken, including one of 1200 tons, nearly all for delivery this year. A sale of 2000 tons of 2.50 to 3 per cent silicon iron to Italy has been made in eastern Pennsylvania, and inquiries amounting to nearly 20,000 tons of malleable iron have come up on behalf of the Italian government. The weakness in Southern iron has affected the price of Northern iron somewhat. As low as \$14.50, Birmingham, has been done on spot No. 2 Southern. Very little has been done in warrants, which have been offered on a basis of \$13.50. We quote at tidewater for early delivery: No. 1 foundry, \$21 to \$21.25; No. 2 X, \$20.25 to \$20.50; No. 2 plain, \$20 to \$20.25; Southern iron at tidewater, \$20.50 to \$21 for No. 1 and \$20 to \$20.25 for No. 2 foundry and No. 2 soft.

Ferroalloys.—The British Government has decided that hereafter all receipts and disbursements of British ferromanganese in the United States will be inspected and approved by the British consul general at New York instead of by the two private New York firms which have acted in this capacity since the stringent rules as to licenses went into effect about a year ago. Demand for the alloy is very quiet and the market is easier, with spot declining. According to rumors

domestic spot ferromanganese is being offered as low as \$225 to \$250, but no sales are definitely reported. The quotation for 1917 is \$175, seaboard, while for fourth quarter of this year \$200 is asked and for third quarter \$225 and higher for the British standard alloy. Arrivals in May were large, probably exceeding the average of 6474 tons per month for the first four months of this year. These, with better prospects for domestic output, have eased the entire market. The fourth cargo of Cuban manganese ore is expected this month. Spiegeleisen is easier and is quoted at \$50 to \$60 for last half. A Canadian consumer is reported to have taken 3000 to 4000 tons of spiegeleisen. Ferro-silicon, 50 per cent, is strong and active, with spot or nearby delivery selling at \$90 to \$100 per ton.

Structural Material.—Dullness in building work and an availability of Bessemer steel for shapes and bars contribute toward a softness in price. The situation is one in which a base of 2.50c., Pittsburgh, is more easily obtained than recently and better deliveries are possible. While it is likely that the price mentioned has never actually disappeared for the attractive lot from a mill standpoint, it is now definitely admitted as a minimum. Besides this, prompt shipments from mill stocks, for some weeks going at 3c., Pittsburgh, may now in cases be closed at 2.75c. It cannot be said that the mills are making a special effort to attract business assumed to be held in abeyance because of price, for the danger is recognized that weakness is too likely to lead to delays by buyers in the desire to cover at the bottom. It indicates instead a temporary condition warranting some measures to move accumulations, as the structural market is strengthened by the continued heavy demand for other forms of steel, particularly the open-hearth product. There is still a strong movement in structural material for industrial plant extensions and railroad bridge inquiry keeps up well, with the Pennsylvania conspicuous, as it is expected will be the case for some months. This road has placed 150 tons with Lewis F. Shoemaker & Co., and is asking for six more bridges, taking 300 tons, and for 300 tons for the subway connection at its New York terminal. Other railroad work includes 500 tons at Richmond for the Southern, which has placed an 850-ton office structure at Washington with the McClintic-Marshall Company; 350 tons at Sayre, Pa., and 700 tons elsewhere for the Lehigh Valley, and 600 tons for a bridge over the Erie barge canal at Rochester, N. Y., for the Erie. New York State is in the market for a building at the Elmira Reformatory, 250 tons, and a power house is to be erected at Springfield, Mass., for an electric light company, taking 800 tons. The Hay Foundry & Iron Works has been awarded 450 tons for a Boys' Club, Avenue A and Tenth Street; the American Bridge Company, 250 tons for a garage at Broad and Cherry Streets, Philadelphia; Lewis F. Shoemaker & Co., 300 tons for the crane runway for the Carpenter Steel Company; the Empire Structural Company is credited with 700 tons for a service building at Greenwich and Vesey Streets for the Underwood Typewriter Company, and with 600 tons for the Waterman building extension, Cortlandt Street, and the Harris-Silvers-Baker Company is the builder of the Poli Theater, New Haven. We quote mill shipments at 2.669c. to 3.169c., New York, depending on the urgency for delivery, and from warehouse at 3.25c. to 3.50c., New York, with large lots at 3.10c.

Steel Plates.—The signs are that if building and railroad car work do not pick up, and there is not much promise in the immediate future, universal plates will not command the prices of sheared plates and deliveries will be much improved. Demand for shipbuilding is still insistent and prices show every likelihood of remaining strong for months. For lots of 1000 tons and more, with delivery in several months, 4c., Pittsburgh, is done. We quote mill shipments at 3.919c., New York, and upward, and such for future business as the mills will consider at 2.919c., New York, and higher. Warehouse prices are 4c. to 4.50c., New York.

Iron and Steel Bars.—With Bessemer bars obtainable in large lots at 2.75c., Pittsburgh, we have revised quotations. Open-hearth bars are scarce, but a sale of

several cars for December delivery is noted at 2.50c., Pittsburgh. In iron bars inquiry is strong and no softening whatever is discernible. For mill shipments of iron bars we quote 2.669c., New York, and for steel bars 2.669c. to 3.169c., New York, according to the urgency of delivery, with 2.919c., New York, the market for largest lots for prompt shipment. From warehouse we quote iron and steel bars at 3.10c. to 3.50c., New York.

Cast-Iron Pipe.—A claim that the base price had receded \$1 per ton seems to be without foundation. Instead prices are firmly held with the makers well booked except on the larger sizes. Good private buying is the feature, as there are no sizeable public lettings under consideration. Carload lots of 6-in., class B and heavier, are maintained at \$30.50 per net ton, tidewater, class A and gas pipe taking an extra of \$1 per ton.

Old Material.—With an embargo re-established against an eastern Pennsylvania mill, and with all the mills comfortably supplied and not concerned over the immediate future, market prices are largely nominal. The continued dullness and good supplies in sight in producers' hands have, however, a softening effect, and sufficient movement has taken place in some classes of scrap to warrant revisions downward, as in machine shop turnings, which are in plentiful supply, and in wrought pipe. Similar changes are expected in re-rolling rails and in light iron. One condition affecting demand is of course the larger amounts of scrap produced by the mills themselves, especially in the making of shell steel with its heavy cropping and the larger use made of pig iron, particularly in mills having blast furnaces and capable of working with hot metal. Brokers quote buyers' prices about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (eastern Pennsylvania specifications)	\$12.50 to \$12.75
Old steel rails (short lengths) or equivalent	13.50 to 14.00
Relaying rails	28.00 to 30.00
Rerolling rails	15.50 to 16.00
Iron car axles	26.00 to 27.00
Steel car axles (for domestic use)	28.50 to 29.00
Steel car axles (for export)	30.00
No. 1 railroad wrought	20.00 to 20.50
Wrought-iron track scrap	16.00 to 17.00
No. 1 yard wrought, long	15.00 to 15.50
No. 1 yard wrought, short	13.00 to 13.50
Light iron	6.50 to 7.00
Cast borings (clean)	8.25 to 8.50
Machine-shop turnings	6.50 to 7.00
Mixed borings and turnings	7.00 to 7.50
Wrought pipe	10.50 to 11.00
Old carwheels (nominal)	15.00 to 15.50
Malleable cast (railroad)	12.25 to 12.75

Cast scrap is in about as little demand as other kinds of old material. Dealers' quotations on cast scrap to consumers are as follows, per gross ton, New York:

No. 1 cast (machinery)	\$17.00 to \$17.50
No. 2 cast (heavy)	15.50 to 16.00
Stove plate	12.00 to 12.50
Locomotive grate bars	12.00 to 12.50

British Steel Market

Pig-Iron Scarcity Growing—Canadian Billets for France

(By Cable)

LONDON, ENGLAND, June 7, 1916.

The pig-iron stringency is unabated and the difficulty in obtaining permits, even for forge iron, is increasing. Billets are firm and wire rods have sold at £22 10s. Canadian billets have gone at £17 c.i.f. France for July and August delivery.

Benzol is quoted at 1s. per gal., toluol at 2s. 4d. and naphtha at 2s. 2d, with ammonium sulphate held at £15 15s. Quotations, mostly nominal, are as follows:

Tin plates, coke, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 37s.	
Steel black sheets, No. 28, export, f.o.b. Liverpool, £20 5s.	
Hematite pig iron, f.o.b. Tees, about 140s.	
Sheet bars (Welsh) delivered at works in Swansea Valley, £12 10s.	
Steel bars, export, f.o.b. Clyde, £18 5s.	
Ferromanganese, £40 to £45 nominal.	
Ferrosilicon, 50 per cent, c.i.f., £29.	

Iron and Industrial Stocks

NEW YORK, June 7, 1916.

A development of the past week was the disposition of securities to weaken with reports of German successes. A speedy change for the better then occurred under the active leadership of stocks of automobile companies. This, however, had an adverse effect on other securities, as a tendency toward tightness in the money market became apparent. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com., 26 3/4 - 27 3/4	Ry. Steel Spring, com., 42 - 44 3/4
Allis-Chal., pref., 82 - 84	Ry. Steel Spring, pref., 96 3/4 - 97 3/4
Am. Can., com., 55 1/4 - 56 3/4	Republic, com., 46 3/4 - 48 1/4
Am. Can., pref., 110 1/4 - 111	Republic, pref., 111 3/4 - 111 3/4
Am. Car & Fdry., com., 59 - 60 3/4	Sloss, com., 53 - 54
Am. Car & Fdry., pref., 117 - 118	Pipe, com., 21 1/4 - 24 1/4
Am. Loco., com., 70 3/4 - 73 1/4	Pipe, pref., 50 - 53 1/4
Am. Loco., pref., 101 3/4 - 102	U. S. Steel, com., 83 3/4 - 86
Am. Steel Fdries., 50 3/4 - 53	U. S. Steel, pref., 117 - 117 3/4
Bald. Loco., com., 87 1/2 - 90 1/2	Westing. Elec., 60 1/4 - 62 1/4
Bald. Loco., pref., 109	Am. Rad., com., 39 1/2 - 39 3/4
Beth. Steel, com., 44 1/2 - 45 1/2	Am. Rad., pref., 136
Colorado Fuel, 42 1/2 - 44 3/4	Am. Ship, com., 84 1/4
Deere & Co., pref., 90	Am. Ship, pref., 84 1/4
Gen. Electric, 169 1/2 - 172	Chic. Pneu. Tool, 72 1/2 - 73 1/4
Gt. No. Ore Cert., 38 - 40 3/4	Cambria Steel, 82 3/4 - 83
Int. Harv. of N. J., com., 112 - 116	Lake Sup. Corp., 9 3/4 - 10 3/4
Int. Harv. of N. J., pref., 117 - 117 3/4	Pa. Steel, pref., 98 - 98 1/4
Int. Harv. Corp., com., 81 1/4 - 82 3/4	Warwick, 11 - 11 1/2
Int. Harv. Corp., pref., 105 3/4 - 108	Cruc. Stl., com., 81 - 86
Lackawanna Stl., 68 - 71	Cruc. Stl., pref., 116 - 117 1/4
Nat. Enam. & Stm., com., 22 1/2 - 25 1/4	Harb.-Walk, Refrac., com., 92 - 92 1/2
N. Y. Air Brake, 130 - 136	Harb.-Walk, Refrac., pref., 102 1/4 - 103
Pitts. Steel, pref., 98 - 98 3/4	La Belle Ir., com., 51 - 52 3/4
Pressed Stl., com., 46	Can. Car & Fdry., com., 68 - 70
Pressed Stl., pref., 100 3/4	Can. Car & Fdry., pref., 85 - 89
	Driggs-Seabury, 118 - 131
	Midvale Steel, 61 3/4 - 64 3/4

Dividends

The New Jersey Zinc Company, extra 5 per cent, payable June 10.

The American Car & Foundry Company, regular quarterly, 1 1/2 per cent on preferred and 1/2 of 1 per cent on the common stocks, payable July 1.

The Allis-Chalmers Company, regular quarterly, 1 1/2 per cent on the preferred stock and an extra 1 1/2 per cent on account of back dividends, payable July 15.

The American Can Company, regular quarterly, 1 3/4 per cent on the preferred stock, payable July 1.

The LaBelle Iron Works, regular quarterly, 2 per cent on the preferred stock, payable July 1.

The Bethlehem Steel Company, regular quarterly, 7 1/2 per cent on the common stock and 1 3/4 per cent on the preferred stock, payable July 1.

The Canadian General Electric Company, regular quarterly, 1 3/4 per cent, payable Aug. 1.

The Hendee Mfg. Company, regular quarterly, 1 3/4 per cent on the preferred stock, payable July 1.

The Yale & Towne Mfg. Company, regular quarterly, 1 3/4 per cent, payable July 1, and an extra of 10 per cent, payable June 7.

The Chandler Motor Company, regular quarterly, 2 per cent and extra 1/2 of 1 per cent, payable July 1. The company on April 1 paid an initial dividend of 1 1/2 per cent. It is understood that the extra of 1/2 of 1 per cent was declared to bring the dividend rate to a full 8 per cent basis, beginning with the first of the year.

The Warwick Iron & Steel Company, distribution of \$1.67 a share, payable to stockholders June 10.

The Dominion Steel Foundries, Ltd., 1 3/4 per cent on preferred stock, 2 per cent on the common stock, and extra 3 per cent on the common.

The Packard Motor Car Company, regular quarterly, 1 3/4 per cent on the preferred stock, payable June 15.

The Ingersoll-Rand Company, regular semi-annual, 3 per cent on the preferred stock, payable July 1.

Ferromanganese Imports

Ferromanganese imports into the United States in April were 6497 gross tons, according to data furnished THE IRON AGE. Of this, 2456 tons came through the port of Baltimore, 2004 tons through New York, 886 tons through Philadelphia, 841 tons through Norfolk, Va., and 310 through New Orleans. The total imports for the first four months of 1916 are 25,898 tons or at the rate of 6474 tons per month, which compares with an average for the year 1915 of only 4600 tons per month.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, effective from April 10, 1916, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c.; Pacific coast, 65c. on plates, structural shapes, iron and steel bars, pipe and boiler tubes, tin plates, nails, spikes and wire. The foregoing rates to the Pacific coast are by rail only.

Structural Material.—I beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zeos 3 in. and over, 2.50c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs.	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909.	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail).	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909.	.20 to .80
Deck beams and bulb angles.	.30
Handrail tees.	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive.	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive.	.50
Cutting to lengths, under 1 ft.	1.55
No charge for cutting to lengths 3 ft. and over.	

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 2.90c. to 4c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3/16 in. take the price of 3/16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gages under ¼ in. to and including 3/16 in.	.10
Gages under 3/16 in. to and including No. 8.	.15
Gages under No. 8 to and including No. 9.	.25
Gages under No. 9 to and including No. 10.	.30
Gages under No. 10 to and including No. 12.	.40
Sketches (including straight taper plates), 3 ft. and over.	.10
Complete circles, 3 ft. in diameter and over.	.20
Boiler and flange steel.	.10
"A. B. M. A." and ordinary firebox steel.	.20
Still bottom steel.	.30
Marine steel.	.40
Locomotive firebox steel.	.50
Widths over 100 in. up to 110 in., inclusive.	.05
Widths over 110 in. up to 115 in., inclusive.	.10
Widths over 115 in. up to 120 in., inclusive.	.15
Widths over 120 in. up to 125 in., inclusive.	.25
Widths over 125 in. up to 130 in., inclusive.	.50
Widths over 130 in.	1.00
Cutting to lengths under 3 ft. to 2 ft., inclusive.	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive.	.50
Cutting to lengths under 1 ft.	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Wire Rods.—Bessemer, open-hearth and chain rods, \$55 to \$60.

Wire Products.—Prices to jobbers, effective May 1: Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, \$2.45; galvanized, \$3.15. Galvanized barb wire and staples, \$3.35; painted, \$2.65. Wire nails, \$2.50 to \$2.60. Galvanized nails, 1 in. and longer, \$2 advance over base price; shorter than 1 in., \$2.50 advance over base price. Cement-coated nails, \$2.50. Woven wire fencing, 61½ per cent off list for carloads, 60½ off for 1000-rod lots, 59½ off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

	Plain Wire, per 100 lb.						
Nos.	0 to 9	10	11	12&12½	13	14	15 16
Annealed	\$2.50	\$2.55	\$2.60	\$2.65	\$2.75	\$2.85	\$2.95 \$3.05
Galvanized	3.20	3.25	3.30	3.35	3.45	3.55	4.00 4.10

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from April 21, 1916, on black and galvanized steel and iron pipe, all full weight.

		Steel		Butt Weld		Iron	
Inches		Black	Galv.	Inches		Black	Galv.
¼, ½ and ¾	63	30½	30½	¼ and ½	52	19	
1	67	46½	46½	¾	53	20	
¾ to 3	70	50½	50½	1	57	33	
				¾ to 1½	60	38	
3	65	45½	45½				
2½ to 6	68	48½	48½	1½	54	33	
7 to 12	65	44½	44½	2	55	34	
13 and 14	53½			2½ to 4	57	37	
15	51			4½ to 6	57	37	
				7 to 12	56	36	

		Reamed and Drifted					
Inches		Black	Galv.	Inches		Black	Galv.
1 to 3, butt	68	48½	48½	¾ to 1½, butt	55	32	
2, lap	63	43½	43½	1½, lap	43	20	
2½ to 6, lap	66	46½	46½	1½, lap	49	27	
				2, lap	50	28	
				2½ to 4, lap	52	31	

		Butt Weld, extra strong, plain ends					
Inches		Black	Galv.	Inches		Black	Galv.
¼, ½ and ¾	59	35½	35½	¼, ½ and ¾	52	29	
1	64	45½	45½	¾	57	38	
¾ to 1½	68	49½	49½	¾ to 1½	61	40	
2 to 3	69	50½	50½				

		Lap Weld, extra strong, plain ends					
Inches		Black	Galv.	Inches		Black	Galv.
2	63	44½	44½	1½	50	28	
2½ to 4	66	47½	47½	1½	55	34	
4½ to 6	65	46½	46½	2	57	37	
7 to 8	61	40½	40½	2½ to 4	59	40	
9 to 12	56	35½	35½	4½ to 6	58	39	
				7 to 8	52	33	
				9 to 12	47	28	

		Butt Weld, double extra strong, plain ends					
Inches		Black	Galv.	Inches		Black	Galv.
¼	55	38½	38½	¾	44	26	
¾ to 1½	58	41½	41½	¾ to 1½	47	29	
2 to 2½	60	43½	43½				

		Lap Weld, double extra strong, plain ends					
Inches		Black	Galv.	Inches		Black	Galv.
2	55	38½	38½	1½	44	25	
2½ to 4	57	40½	40½	2	44	25	
4½ to 6	56	39½	39½	2½ to 4	46	30	
7 to 8	51	30½	30½	4½ to 6	45	29	

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Sheets.—Makers' prices for mill shipments on sheets, of U. S. standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net, or 2 per cent cash discount in 10 days from date of invoice:

Blue Annealed Sheets		Cents per lb.
Nos. 3 to 8.		2.95 to 3.20
Nos. 9 to 10.		3.00 to 3.25
Nos. 11 and 12.		3.05 to 3.30
Nos. 13 and 14.		3.10 to 3.35
Nos. 15 and 16.		3.20 to 3.45

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Box Annealed Sheets, Cold Rolled		Cents per lb.
Nos. 17 to 21.		2.70 to 2.80
Nos. 22 and 24.		2.75 to 2.85
Nos. 25 and 26.		2.80 to 2.90
No. 27.		2.85 to 2.95
No. 28.		2.90 to 3.00
No. 29.		2.95 to 3.05
No. 30.		3.15 to 3.25

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Galvanized Sheets of Black Sheet Gage		Cents per lb.
Nos. 10 and 11.		3.75 to 3.85
No. 12.		3.85 to 3.95
Nos. 13 and 14.		3.85 to 3.95
Nos. 15 and 16.		3.95 to 4.05
Nos. 17 to 21.		4.10 to 4.20
Nos. 22 and 24.		4.20 to 4.30
Nos. 25 and 26.		4.35 to 4.45
No. 27.		4.60 to 4.70
No. 28.		4.75 to 4.85
No. 29.		4.90 to 5.00

Above prices are for Bessemer stock. For open-hearth stock \$2 per ton advance is charged.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, on lap-welded steel tubes and standard charcoal-iron tubes, effective from April 15, 1916, are as follows:

Lap Welded Steel		Standard Charcoal Iron	
Inches		Inches	
1½ in.	35	1½ in.	27
1¾ and 2 in.	47	1¾ and 2 in.	39
2¼ in.	44	2¼ in.	36
2½ in.	50	2½ in.	42
2¾ and 3 in.	55	3 and 3¼ in.	47
3 and 3½ in.	56	3½ to 4½ in.	48
3½ to 4½ in.	56	5 and 6 in.	41
5 and 6 in.	49	7 to 13 in.	38
7 to 13 in.	46		

Locomotive and steamship special charcoal grades bring higher prices.

1½ in. over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery							
	Copper, New York	Tin, Electrolytic	New York	Lead, New York	St. Louis	Spelter, New York	St. Louis
May 31.....	28.25	28.00	45.75	7.35	7.15	13.75	13.50
June 1.....	28.25	28.00	45.50	7.25	7.12½	13.25	13.00
2.....	28.25	28.00	44.75	7.00	6.85	13.00	12.75
3.....	28.25	28.00	.....	7.00	6.85	13.00	12.75
5.....	28.25	28.00	44.25	7.00	6.85	13.25	13.00
6.....	28.25	28.00	44.25	7.00	6.85	13.62½	13.37½

NEW YORK, June 7, 1916.

Spelter is the only metal which is showing any life or tendency to advance in price. Copper has continued dull but prices are unchanged. Tin is lower with consumers showing only slight interest. The leading producer of lead has reduced quotations, and independents are meeting the new price, but there is little doing. Antimony has declined steadily but no one seems to want it.

New York

Copper.—Throughout the week the market has been nominal with scarcely enough drift to indicate prices. It is certain, however, that nearby electrolytic could be had at around 28c., cash, the premium on nearby positions having practically disappeared. Most of the copper offered has been held by second hands, although the producers have some to offer also, but no large quantities. The fact that some consumers are over supplied accounts for some of the offerings, but these would quickly be withdrawn if the market should become active. Lake is purely nominal at about 28.25c., cash. The London electrolytic market shows some improvement, having advanced £2 to £142, June 6. The exports this month, including yesterday, total 6619 tons.

Copper Averages.—The average price of Lake copper for the month of May, based on daily quotations in THE IRON AGE, was 28.87½c., and for electrolytic, 28.44c.

Tin.—Except on Friday and Saturday the market has been stagnant. On those two days combined between 200 and 250 tons of various positions changed hands. Since then it has been almost impossible to interest consumers. Offerings have been made at low figures, but these seem to have no result except to make buyers even more timid. The supply of Banca tin, which has been unusually large, is now pretty well absorbed, but more is coming, and deliveries in July have been offered at 41.50c. Spot Straits tin was quoted yesterday at 44.25c. The arrivals this month total 1265 tons, and there is afloat 3617 tons.

Lead.—The market was dull and easy all of last week, with sellers anxious to get business and cutting prices to do so. The only bright spot was on Thursday, when several export deals, involving from 200 to 250 tons each, were put through. Late on Friday the American Smelting & Refining Company reduced its New York price from 7.50c. to 7c. and its St. Louis quotation from 7.42c. to 6.92½c., actually selling at these prices and not merely quoting them as a basis for monthly averages. The reduction, which was followed by independents, did not induce any great amount of business, however, and the market has since been unsettled and contradictory, and as dull as before. Quotations yesterday were unchanged. The exports this month, including yesterday, total 502 tons.

Spelter.—Since last Friday a large amount of spelter has been purchased and the market has a better tone, with quotations ½c. to ¾c. higher. On that day the low point was reached. At 12.75c., St. Louis, for June delivery and 13c., New York, export buyers took hold in earnest, and with them domestic consumers became active. Yesterday the June quotation was about 13.37½c., St. Louis, and 13.62½c., New York. The last half sold yesterday at 11.75c. and the fourth quarter at 11.12½c. In the past few days there has been some strike trouble in the Joplin district, but it has about reached its end. A pleasing phase of the situation is

that galvanizers have bought, and some are figuring to buy ahead as far as the fourth quarter. Cases are mentioned of the starting up of galvanizing plants which have been idle. The brass mills are filled up and buying but little. The premium on brass mill special is steadily becoming smaller. The exports this month, including yesterday, total 423 tons.

Antimony.—This metal is little short of demoralized. Prompt Chinese and Japanese can be had without difficulty at 23c., duty paid, and it is probable that 22c. would not be declined. There is a surplus of the metal available, a good part of which is being held in hopes of a stronger market. Holders have already lost money and are likely to lose more unless the market makes a turn upward. The one encouraging feature consists of reports of foreign inquiry.

Aluminum.—For No. 1 virgin aluminum, 98 to 99 per cent pure, the market is unchanged at 58c. to 60c.

Old Metals.—Unsettled conditions still govern the market. Dealers' selling prices are revised as follows:

	Cents per lb.
Copper, heavy and crucible.....	25.00 to 26.00
Copper, heavy and wire.....	24.50 to 25.50
Copper, light and bottoms.....	20.00 to 21.00
Brass, heavy.....	14.50 to 15.00
Brass, light.....	11.50 to 12.50
Heavy machine composition.....	18.00 to 18.50
No. 1 yellow rod brass turnings.....	14.50 to 15.50
No. 1 red brass or composition turnings.....	15.00 to 16.00
Lead, heavy.....	6.25
Lead, tea.....	5.75
Zinc.....	9.50 to 10.50

Chicago

JUNE 5.—Of the non-ferrous metals copper alone is being held without appreciable decline in price. Tin, lead, zinc and spelter are all lower. We quote: Casting copper, 26.75c. to 27c.; Lake copper, 28.50c.; tin, carloads, 45.50c., and small lots 47.50c.; lead, 6.95c.; spelter, 13.25c.; sheet zinc, 22.50c.; Cookson's antimony, 50c.; other grades, 27c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 21c.; copper bottoms, 19c.; copper clips, 20.50c.; red brass, 17.50c.; yellow brass, 13c.; lead pipe, 5.75c.; zinc, 11c.; pewter, No. 1, 28c.; tinfoil, 33c.; block tin pipe, 38c.

St. Louis

JUNE 5.—Non-ferrous metals have eased off considerably, with the result that the close to-day was at the following figures: Lead, 7c. bid, 7.25c. asked; spelter, 12.50c. to 13c.; tin, 45c. to 46c.; Lake copper, 29.50c.; electrolytic copper, 29c.; antimony, Asiatic, 30c. In the Joplin ore district there was a drop in prices, although the threatened shutdown of many mines because of labor troubles caused considerable activity in getting hold of supplies of ore. The best basis price for zinc blende reported for 60 per cent metal was \$90 per ton, with premium grades reaching \$93, while the range was as low as \$60 for second grade. The average for the week's sales in the district was \$73. In calamine the range for 40 per cent was \$50 to \$52.50, with the average for the week \$54 because of premium settlements. In lead ore the drop was sharp to \$82.50 for 80 per cent, but the average for the district held up to \$88 because of higher prices in the earlier part of the week. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 10c.; heavy yellow brass, 13.50c.; heavy red brass and light copper, 16c.; heavy copper and copper wire, 20c.; pewter, 25c.; tinfoil, 35c.; lead, 5.75c.; tea lead, 4c.; zinc, 10c.

As in other industrial centers of the country, the question of "setting the clock back an hour" is being agitated in Milwaukee, and in several instances industrial concerns have adopted the scheme of permitting employees to start work an hour earlier than formerly. At the Milwaukee works of the International Harvester Company, employing more than 2000 operatives, the day now begins at 7 o'clock and ends at 4.30, working nine hours as before. The adoption of the plan has not become general, but seems to be making headway. Public utility corporations are trying it out in Milwaukee and other Wisconsin cities.

SHEET METAL MEETING

Manufacturers Meet with Jobbers of Tin Plates and Sheets to Discuss Mutual Interests

On Friday and Saturday, June 2 and 3, at Pittsburgh, the interests of manufacturers and jobbers of tin plates and sheets were considered on the occasion of the annual meeting of the Metal Branch of the National Hardware Association. There was a good attendance of manufacturers' representatives. Chairman W. H. Donlevy presided. An address of welcome was made by A. J. Beeler, president National Hardware Association. The report of the metal committee, read by Chairman Donlevy, set forth the conditions which had been brought about by the war in increasing the cost of goods and advancing prices. He stated that all had not profited from these conditions. There was criticism of jobbers whose prices had not followed the market, and there was no occasion for the fierce competition among jobbers for business at prices under those of rolling mills and where prices and delivery were considered rather than quality and service. The report deprecated the neglect of manufacturers' terms of sale and urged closer collection from customers.

H. L. McKenzie presented the report of the committee on legislation affecting the marking and stamping of metal products. A review was given of bills which had been presented before Congress in connection with this subject. The assemblage voted in favor of any movement in or out of Congress that will foster commercial honesty.

In discussing "methods of inducing your competitors to follow market advances," T. James Fernley stated that the best method was to follow them individually. He gave a number of pertinent facts bearing practically on this subject.

A report was presented by H. C. Nickerson, Congdon & Carpenter Company, on municipal and state legislation. The need of more strict regulation of the use of fire-proofing materials for roofs was emphasized.

The ever-present question of mills competing with jobbers was the subject of a discussion opened by J. J. Fite. He set forth the belief that a happy mean should be found between the extremes where jobbers feel that mills should turn to them all orders and mills feel that the jobbers should have only the little orders, as both mills and jobbers are essential to the best interests of the trade. He thought the dividing line might be found in the carload order. Others who engaged in the discussion found difficulty in endeavoring to indicate the line of separation. Some stated that more trouble is found with competition from jobbers than from mills. Complaints were made by some manufacturers that jobbers do not advance their prices with the manufacturers, while, on the other hand, it was claimed that mills do not cover the jobbers with sufficient differentials or give sufficient notice to them of advances. The fact was quite prominent in this discussion that the jobber is essential and should have his interest carefully fostered, but at the same time it appeared to be the opinion that it would never be possible to rid the relations of mills and jobbers of some degree of discord.

It was brought out that some mills are sending out stock lists, not only to jobbers and retailers, but in some cases to consumers. This practice was condemned by the jobbers, who considered it was not fair to them. On the other hand, several representatives present from the mills stated that these lists represented only odd lots that ordinarily jobbers would not care to handle, and the lists were sent to consumers in the hope of moving these lots promptly.

A topic discussed with some interest was as to whether jobbers had kept a percentage of the profits from stock on hand and contracted for, as compared with profits due to advancing prices.

A special committee made a report on how to promote the sale of tin plates and sheet metals. In connection with this matter the secretary was requested to collect and make a list of private brands in general use.

An able paper on the present and future supply of spelter was presented by W. A. Cook of the Matthiessen & Hegeler Zinc Company, La Salle, Ill. William M. McFate of the Trumbull Steel Company, Warren, Ohio, followed, expressing the opinion that the present price of spelter, which is about 13c., is being largely held by the European war, which has created a heavy foreign demand, and also on account of the abnormal domestic demand, not only from sheet mills, but from makers of munitions.

Other subjects discussed were the methods of remunerating salesmen, the importance of cash discounts to the jobber, the abuse of terms, the cost of doing business, the importance of accurate cost figures, reducing the expense account, etc.

The question of conducting a national advertising campaign to increase the use of sheet metal in roof construction was considered.

The National Association of Corporation Schools

The National Association of Corporation Schools held a meeting in Pittsburgh last week and discussed such subjects as the care of unskilled laborers, particularly foreigners, the development of mechanical office employees, and the best and quickest way of getting help to users of labor.

J. E. Banks of the Ambridge, Pa., works of the American Bridge Company, submitted a report on unskilled labor and C. B. Auel of the Westinghouse Electric & Mfg. Company, read a report of the committee on safety and health. In part he said:

"Installation of safety-first appliances in factories and industrial establishments is the last letter in the alphabet of safety achievement. Education is needed, and the communities, not the workmen, should be the first educated.

"The best industrial tonic that could be given to the United States would be an immigration law which would give the nation time to assimilate the present bulk of uneducated foreign-born people. In our plant we have a labor turn-over of 50 per cent. We find that a large percentage of the accidents are caused by carelessness, and mostly carelessness on the part of the person injured. We have safety devices and we attempt to educate the workmen, but with one-half of them coming and going we never get further than the fundamentals. I believe that safety and health cannot be achieved without education; but I also believe that we should extend the education into the homes of the workmen."

In the discussion of health matters it developed that the Armstrong Cork Company, Pittsburgh, was the first concern in the United States to introduce a dental clinic. Since that time similar clinics have been established in dozens of establishments throughout the country.

P. T. Dillon Buys Delaney Forge

The Delaney Forge & Iron Company, Buffalo, N. Y., having one of the largest and best equipped forge plants in that city, has been purchased by P. T. Dillon, president Titusville Forge Company, Titusville, Pa. Mr. Dillon became president of the Delaney Forge & Iron Company June 1, resigning from the Titusville Forge Company. David C. Howard, former president and principal stockholder of the Delaney Company, and connected with that company for the past 40 years, has sold his entire interest, with the other stockholders, to Mr. Dillon. Sufficient ground is owned at the Delaney plant, at Perry and Louisiana streets and the Lehigh Valley Railroad, to double the capacity of the plant if necessary. One department of the company's business is devoted to large and special ship forgings.

The Canton Company, Commerce and Water streets, Baltimore, Md., is having a large pier erected at Canton, Md. It will be 600 ft. long and 77 ft. wide, with an 85-ft. section parallel with the shore. It will be used mainly for the purpose of handling ore shipments and will be equipped with modern machinery for carrying on this work, including a gantry. The structure was designed by the Cleveland Dock Engineering Company, Cleveland, Ohio.

PERSONAL

Effective June 15, Louis N. McDonald, now superintendent of the Ohio district of the Carnegie Steel Company, which embraces the blast furnaces, Bessemer and open-hearth steel works at the Ohio works, and the upper and lower mills, all in Youngstown; Niles blast furnace at Niles, Ohio; the Greenville bar mills at Greenville, Pa., and the new bar mills at McDonald, Ohio, will succeed John Hughes as assistant general superintendent, J. H. Gross being general superintendent. Mr. Hughes is now assistant to James A. Farrell, president United States Steel Corporation. Mr. McDonald went to Youngstown in 1901 from the Duquesne works of the Carnegie Steel Company as superintendent of the Bessemer department at the Ohio works. When the open-hearth furnaces at the Ohio works were built in 1909, he was made superintendent of this department also. He is a brother of Thomas McDonald, consulting manager of the Ohio and Western Pennsylvania districts of the Carnegie Company.

N. P. Hyndman, local sales agent for the Washington Coal & Coke Company, Dawson, Pa., has returned from an extended visit to California.

J. Leonard Replogle, of the American Vanadium Company, has been made a director of the Wabash Railroad.

R. C. Steese, vice-president and general manager of the Brier Hill Steel Company, Youngstown, Ohio, has resigned. He has been actively connected with this concern since its organization, and prior to that time was secretary and general superintendent of the Brier Hill Iron & Coal Company, operating Grace furnace at Youngstown. His first business connection was with the Dayton Coal & Iron Company of Dayton, Tenn., and in 1890 he went to Youngstown and entered the employ of the Brier Hill Iron & Coal Company as a chemist, subsequently being made general superintendent of the plant. He is a director of the Youngstown & Southern Railway Company, the Dollar Savings Bank, vice-president of the Northern Heights Land Company and vice-president of the Brier Hill Coke Company. Mr. Steese will continue as a member of the board of directors of the Brier Hill Steel Company.

A. L. Humphrey, vice-president and general manager of the Westinghouse Air Brake Company, Wilmerding, Pa., recently discussed the mobilization of materials and industrial resources at Carnegie Music Hall, Pittsburgh, in a series of lectures on military engineering.

H. R. Sterrett, for several years connected with the Standard Scale & Supply Company, Pittsburgh, has been appointed Pittsburgh representative of the Pittsburgh Pneumatic Company, Canton, Ohio, manufacturer of riveting, chipping and sand-ramming machinery.

A. P. Saxer, who has been associated with the machinery trade in the Central West for a number of years, and recently in the machine-tool business in Erie, Pa., under the name of the A. P. Saxer Machinery Company, has become connected, as a partner, with E. S. Cullen in the E. S. Cullen Machinery Company, 340 Leader-News Building, Cleveland, Ohio.

Joseph E. Greensmith, assistant general manager of the New England Westinghouse Company, has resigned to become president of the Boston Scale & Machine Company, Boston. He was formerly general manager of the Mason Machine Works, Taunton, Mass.

W. B. Thompson and Albert H. Wiggin have resigned as directors of the Hendee Mfg. Company, Springfield, Mass. Their places have been filled by A. F. Knobloch, Jr., and Samuel H. Muller, vice-president of the Chase National Bank, New York.

Charles A. Gross has resigned as assistant sales manager, structural steel department, Bethlehem Steel Company at New York, and has joined the Harris-Silvers-Baker Company, 151 West Forty-second Street, New York, engaged in the fabrication and erection of

steel structures. This company is being reorganized and it is understood Mr. Gross will be secretary of the new company.

Henry M. Shaw, formerly Eastern representative of the Gardner Machine Company, Beloit, Wis., has associated himself with Sherritt & Stoer Company, Inc., 603 Finance Building, Philadelphia, and will represent the company in connection with its regular line, giving special attention to the Gardner products.

Clyde E. Dickey has resigned as secretary and sales manager of Denman & Davis, New York, with whom he has been associated for the past eleven years. He has organized the Dickey Steel Company, of which company he is president, with offices in the Woolworth Building, New York. The new company will represent a number of steel manufacturers. Mr. Dickey was with the Crucible Steel Company of America for five years prior to his connection with Denman & Davis.

Edward G. Caughey, formerly assistant chief engineer of the Youngstown Sheet & Tube Company, Youngstown, Ohio, has resigned to become general manager of the Pennsylvania Tank Car Company, Masury, near Sharon, Pa.

Quincy Bent, general manager of the Steelton plant of the Pennsylvania Steel Company, has given \$600 as the company's contribution toward establishing playgrounds in the borough. The use of a large plot of ground at Front and Angle streets is also offered.

W. Walley Davis, who recently resigned as superintendent of the Steelton, Lebanon and Dunbar, Pa., plants of the Semet-Solvay Company, to become district manager of the By-Products Coke Corporation at Chicago, was presented with a gold watch by fellow employees on May 29. He will be succeeded at Steelton by C. E. Lewars, formerly his assistant.

N. C. Harrison is now general superintendent of the Atlantic Steel Company, Atlanta, Ga., having been appointed to that position in April. He was formerly with the Pittsburgh Crucible Steel Company, Midland, Pa., as steam engineer, resigning from that connection some time ago to take a similar position with the Atlantic Steel Company.

W. R. Lovelace, chief electrician at South Works, Illinois Steel Company, South Chicago, Ill., has resigned to accept a similar position with the Tata Iron & Steel Company, India.

Alvan Macauley will shortly be made president of the Packard Motor Car Company in title. For the past two years he has been virtually president, and Henry B. Joy, now president, desires that the title be conferred upon him. Mr. Joy will be active in the affairs of the company in the capacity of chairman of the board.

D. W. Patten, for several years with the Windsor Machine Company, selling Gridley automatics in Ohio, will represent in the same territory the New Britain Machine Company, New Britain, Conn.

G. R. Delamater has been made fuel engineer at the Steelton plant of the Pennsylvania Steel Company. He will be in charge of all coal washings; the supervision of the coal stock, including coking, bituminous, gas, slack and anthracite coal, coke breeze and the disposition of these products to the various departments; sampling of coal; the deliveries of gas, tar, coke and coke breeze, and miscellaneous matters between the various operating departments and the Semet-Solvay Company.

George W. Wenz, for several years assistant purchasing agent, has been appointed purchasing agent of the Gould Coupler Company, Depew, N. Y.

Two scholarship funds, with an income of \$500 and \$400 respectively per year, have been established by the Chemists' Club of New York, to be devoted to assisting deserving young men to obtain an education in the field of industrial chemistry or chemical engineering. Inquiries should be addressed to the Bloede Scholarship Committee or the Hoffmann Scholarship Committee of the Chemists' Club, 50 East Forty-first Street, New York.

OBITUARY

THOMAS MCNEIL, Sr., a pioneer boiler manufacturer of Pittsburgh, Pa., and president of the James McNeil & Bro. Company, died May 28, aged 76 years. He was born in Rutherglen, Scotland, and came to America with his parents when eight years old, settling in Canada. In 1860 he removed to New York City. During the Civil War he was employed in navy yards, looking after transport vessels for the United States Government. In 1865 he went to Pittsburgh and started, with his brother James, in the boiler business, which business was incorporated in 1900 under the present name of the James McNeil & Bro. Company. Mr. McNeil became widely known in the boiler trade, his thorough knowledge and long experience in steel plate construction work making him an authority in this line. He was granted several patents in connection with his business, and was one of the first manufacturers who advocated and developed the use of riveted steel pipes for large diameter conduits. He leaves his widow and one son, Thomas, Jr., with six grandchildren.

JOHN BARNES, president of the W. F. & John Barnes Company, Rockford, Ill., best known as a manufacturer of drills, died May 29 at the age of 82, following a protracted period of ill health. Although at the head of his company he had not been active in business since 1908. He went to Rockford in 1860 and with his brother established the company which bears his name in 1872, to manufacture the Barnes scroll saw. The building of lathes and drilling machines was started in the early eighties. He was active in the educational and commercial interests of Rockford until the time of his death. He leaves two sons, Aubrey T. Barnes and John S. Barnes, both of whom have been actively engaged in the company's business for a number of years.

HENRY WHITELEY, president McCullough Iron Company, Wilmington, Del., died May 27 at a local hospital, aged 67 years. He had been connected with the company for many years, starting in a humble position. His rise was rapid. At the time of his death, his wife was visiting her daughter, Signora Alda Feruglio, the wife of a physician of Milan, Italy. He was president of the Wilmington Club and prominent in other social organizations.

FREDERICK C. BREAKSPEAR, general manager of the A. G. Spalding plant at Chicopee Falls, Mass., for the past 20 years, died at Haworth, N. J., June 2, after an illness of over three months. When a young man he entered the employ of the Peck & Snyder Company, remaining with it until the business was bought by the Spalding Company. He rose from a minor position in the company's offices to the position of general manager.

COL. HENRY LOUIS PIERSON died June 2 at his home in Lawrence, L. I., aged 84 years. He was born in New York City and engaged in the iron and steel business at an early age. He served with distinction in the Civil War and was brevetted colonel of New York volunteers. After the war he re-entered the firm of Pierson & Co., 29 Broadway, continuing active until 1910, when he retired.

CHARLES S. HINCHMAN died June 3 at his summer home in Point Pleasant, N. J., aged 75 years. He was connected in an official capacity with the Pennsylvania Steel Company for a long period in the early years of the existence of that company. More recently he had been engaged in New Jersey real estate development.

JOHN K. STEWART, president Stewart-Warner Speedometer Company, died suddenly June 3 at his home in New York City, aged 46 years.

ARMORY COFFIN, for many years chief engineer of the Phoenix Iron Company, Phoenixville, Pa., but long retired, died June 5, aged 75 years. During the Civil War he served in the Confederate army. He was one

of the oldest members of the American Society of Civil Engineers.

EDWARD F. ERZINGER, Chicago, manager of the branch office of Landers, Frary & Clark, Inc., New Britain, Conn., died suddenly from heart failure May 20. He had been a resident of Chicago for many years. He leaves his widow and two children.

MORTIMER H. WRIGHT, mechanical superintendent and one of the founders of the Pennsylvania Shafting Company, Spring City, Pa., died May 28, after an illness of several months, aged 49 years. He leaves his widow and four sons.

Wheeling-Connellsville Railroad Projected

Steel manufacturers in the Wheeling district, who have long desired a direct railroad line to their works from the Connellsville coke region, have actively taken up the proposition of building a road. Application for a charter for the Wheeling & Eastern Railroad Company has been made, to both West Virginia and Pennsylvania by I. M. Scott, B. W. Peterson, J. J. Holloway, Alexander Glass, C. R. Hubbard, A. S. List, Edward Hazlett, J. C. Brady, E. C. Ewing, William F. Stifel, C. N. Brady and H. C. Ogden. This list of incorporators includes the heads of most of the large manufacturing concerns in the Wheeling district. The plan is to build a line about 60 miles long, connecting the Monongahela River at McCanns Ferry, a few miles west of Connellsville, with the Ohio River, at or near the mouth of Boggs Run, Benwood. A branch line would be run to Millsboro, also on the Monongahela River. The entire territory to be thus traversed is underlaid with Pittsburgh vein coal. The Greene County field particularly is rich in coal of the highest quality for coking and manufacturing purposes. The present coal and coke rates from the Monongahela Valley to the manufacturing plants in the Wheeling district is \$1.20 per ton. It is believed that, with the construction of the proposed line, coal and coke can be delivered to Wheeling at a cost not to exceed 50c., and probably less. Under present conditions, the blast furnaces and steel plants in the Wheeling district must pay about 90c. per ton above their Pittsburgh competitors.

Meeting of Drop Forge Association

The American Drop Forge Association is to hold a meeting at the Hotel Adelphia, Philadelphia, Pa., June 9 and 10. Subjoined is a list of the topics to be discussed through the presentation of papers and otherwise, according to the tentative program. The sessions are to open on Friday, June 9, at 10 a. m., and close Saturday noon. A banquet will be held on Friday night. Saturday afternoon and Sunday are to be spent at Atlantic City, with headquarters at the Hotel Traymore. E. B. Horne, 1516 Helen Avenue, Detroit, Mich., is secretary and treasurer of the association. Following is the tentative list of papers:

- Best methods pursued in up-to-date forge shops in making six-throw crankshafts.
- Manufacture of forging steel.
- Forging of automobile front axles.
- Heat treatment of drop forgings.
- Making of shrapnel shells by the hydraulic process.
- Recent developments in the use of upsetters with reference to finished gear forgings.
- How to figure profits on an estimate in a jobbing forge plant.
- Corrective work on forgings by the electric welding process.
- Sources of heat for forging furnaces.
- The manufacture of die blocks.
- The hammer hour overhead system.
- Selection of proper machine for making forgings.
- The prevention and elimination of seams in alloy steel.
- Sandblasting of forgings.
- Why should we allow cash discounts?
- Record systems on forge estimates and costs.
- The labor situation—general discussion.

The National Association of Brass Manufacturers will hold its next meeting at the Congress Hotel, Chicago, June 19 and 20. It was to have been held at Detroit, June 14 and 15, but two large conventions previously booked took up all available hotel space.

Pittsburgh and Nearby Districts

The Cambria Steel Company, Johnstown, Pa., has purchased a foundry in that city formerly operated by the Union Machine & Stamping Company, and will use the plant for making castings for its own works.

In an effort to expedite action on the claim of the McClintic-Marshall Company, Pittsburgh, for work done on the Panama Canal, Senator George T. Oliver has introduced in Congress a bill which has been sent to the Senate Committee on Claims. It provides that the Secretary of the Treasury be directed to pay to the company \$714,007.39, as recommended in a commission report made to Congress. This is a claim made by the company for extra work done on the Panama Canal lock gates, and also for losses sustained by delays in the construction of the work, for which the company claims it was in no way responsible.

The Vanadium Alloys Steel Company, Pittsburgh, has issued a stock list of Red Cut Superior high speed steel, made at its works in Latrobe, Pa., and quotes a price of \$3 per lb. base, subject to all high speed steel standard extras, as adopted July 22, 1915.

The Pittsburgh Steel Company will call for payment on July 1 the remaining \$1,000,000 6 per cent notes, due Jan. 1, 1920. The company has already paid off from surplus earnings \$4,000,000 of the \$5,000,000 original issue.

The Epping-Carpenter Pump Company, Pittsburgh, has received an order for a 300,000-gal. pumping engine for the local board of control of Pittsburgh. It will be installed in the water works in that city.

John McLeod, of the Carnegie Steel Company, and president of the National Association of Corporation Schools, which held its fourth annual convention in Pittsburgh last week, states that a Pittsburgh chapter of the association will be established next fall, which will be the first of similar local organizations to extend the work. He says that the constantly expanding importance of the corporation school idea calls for frequent discussion of details and necessitates the formation of local chapters.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has appropriated \$100,000 to be used in making additions and betterments to its two blast furnaces at Hubbard, Ohio. A new ore bridge will be built and some additions made to the pumping equipment. About July 1 the company will commence to receive pig iron from these two stacks, as the contracts of the Andrews & Hitchcock Iron Company will have been pretty well cleaned up by that time.

The Bessemer & Lake Erie Railroad, a Carnegie Steel Company interest, has been given authority by the Ohio Public Utilities Commission to issue \$3,600,000 of gold bonds, bearing 5 per cent interest, to purchase 2500 new cars and 20 locomotives.

The Western Conduit Company, Youngstown, Ohio, L. J. Campbell president, an interest of the Youngstown Sheet & Tube Company, is planning to build plant additions to cost about \$50,000.

The National Stamped Sheet Metal Company of Beaver Falls, Pa., was recently incorporated with a capital of \$10,000, and has leased and equipped a plant for making stamped sheet metal work. It will be in the market for small gray iron castings, ornamental iron castings and hooks for copper plating and oxidizing. The officers are W. H. Pifer, president; D. H. Jones, vice-president; W. N. Potts, treasurer, and L. G. Spencer, secretary.

The Pennsylvania Tank Car Company, Sharon, Pa., recently received an order for 50 steel tank cars for a Southern oil concern. The company is turning out about ten completed tank cars per day and has work ahead for some months.

The Pittsburgh Steel Company will call for payment on July 1, \$1,000,000 of its 6 per cent notes, due Jan. 1, 1920, having paid off out of surplus earnings \$4,000,000 of the original \$5,000,000, issued Jan. 1, 1915, and due serially Jan. 1, 1918, 1919 and 1920. The company is building at Monessen four 60-ton open-hearth furnaces which are expected to be ready for

operation about Aug. 15, giving it a total of 12 such furnaces. It is operating its two blast furnaces, steel plant, rod and wire mills at Monessen to utmost capacity and is not offering any of its products for delivery before October of this year.

The coal strike in the Pittsburgh district is seriously affecting the steel mills that have mines in that district, and at present there is no indication of an early settlement. This week only three of the mines of the Pittsburgh Coal Company are running, and practically all the other union mines are idle. Prices have advanced rapidly, and run-of-mine coal is selling at \$1.75 to \$2, about the same prices being asked for slack. Considerable Connellsville coal is being shipped to steel mills in the Pittsburgh district. This is cutting down output of coke to some extent and is partly the reason for the higher prices quoted on furnace coke for spot shipment.

The George J. Hagan Company, People's Bank Building, Pittsburgh, has completed the erection of sheet and pair furnaces, stoker-fired, and several batteries of box annealing furnaces, also stoker-fired, for the new addition to the plant of the Canton Sheet Steel Company, Canton, Ohio, and has received a second contract from that company for furnace equipment for its two new jobbing mills. A contract from the Wheeling Steel & Iron Company, Wheeling, W. Va., calls for the erection of sheet and pair and annealing furnaces, stoker-fired, for the new additions to its plant. These pair furnaces are of the patented Allis continuous type. The company has also received a contract from the Baltimore Sheet & Tin Plate Company, now owned by the Bethlehem Steel Company, for the furnace equipment for its 12 sheet and tin mills. Another contract placed some time ago with the Pittsburgh Company includes the erection of 22 sheet furnaces, 22 pair furnaces and seven double box annealing furnaces. The pair and sheet furnaces will be of George J. Hagan Company standard equipment; the annealing furnaces are equipped with stokers and can burn either coal or coke oven gas. Orders are also in hand for annealing or heating furnaces for the Prest-O-Lite Company, the Otis Steel Company, and the Trumbull Steel Company. The Simmons Company, Kenosha, Wis., is installing a continuous rail heating furnace, and the Witherow Steel Company, Pittsburgh, a continuous rail heating stoker-fired furnace. The Hagan company has an order from the American Sheet & Tin Plate Company for four stoker equipments for the annealing furnaces at its American works, at Elwood, Ind., and has completed the stokers on the sheet and pair furnaces in the same company's Crescent works at Cleveland. The Jones & Laughlin Steel Company is providing a double length stoker-fired box annealing furnace at Woodlawn, Pa.

Monday, June 5, was known as "railroad preparedness day" at the plant of the Westinghouse Air Brake Company, at Wilmerding, Pa. On that day the company opened its large ammunition plant for inspection of railroad mechanical officials from all over the country. The operation of producing an 18-lb. shrapnel shell loaded with 327 bullets and provided with time fuse was witnessed by the visitors. Last year the Westinghouse Air Brake Company took a contract from the British Government to furnish 1,250,000 18-lb. 3-in. shells complete. In spite of interruptions due to labor troubles, the erection of new buildings and the installation of new machinery, the company has been turning out 10,000 shells per day for some time. From the works of the Westinghouse Air Brake Company the guests went to the shops of the Westinghouse Electric & Mfg. Company, at East Pittsburgh, and later to the plant of the Union Switch & Signal Company at Swissvale.

The Robert Swan, Jr., Company, Pittsburgh, with a capital stock of \$16,700, has been incorporated by Robert Swan, Jr., 6319 Walnut Street, Pittsburgh; Arthur M. Brown, New Castle, Pa., and George C. Swan, McPherson Boulevard, Pittsburgh, to engage in engineering construction work. The new company has taken over the interests of the firm of Robert Swan, Jr., for \$10,200.

The Penn Iron & Steel Company, Pittsburgh, with

a capital stock of \$50,000, has been incorporated by Paul A. Stuart, Cheswick, Pa.; James Milholland, 1015 Park Building, Pittsburgh, and I. M. Ryan, Pittsburgh, to manufacture iron and steel.

The Erie & Western Transportation Company has awarded a contract to the Stevens Engineering Company, Chicago, for the erection of a grain elevator at the foot of Holland Street, Erie, Pa., to cost approximately \$300,000.

The Brier Hill Steel Company, Youngstown, Ohio, will start work soon on the erection of a benzol plant, which it hopes to complete about the same time that its by-product coke ovens will be finished, probably in December.

STRIKES AND WAGE ADVANCES

A Strike Against the Eight-Hour Day

One of the most peculiar strikes that has occurred in New England for a long while took place at the plant of the Fisk Rubber Company, Chicopee Falls, Mass. The employees of the heater department went out because of dissatisfaction with the eight-hour day, which was one of the conditions of the settlement of labor troubles at the plant a few days ago. It appears that under the new straight eight-hour shifts the men in this department were unable to earn as much as under the old conditions where they were working a considerable number of hours overtime. The men returned to work June 5, pending an adjustment to be made on or before June 17. The pledge of this adjustment was made previous to the strike, but this section of the employees refused to abide by the arbitration agreement under which the former strike was settled. They returned to work after listening to a discussion of the conditions of the arbitration agreement by Commissioner Bump, of the State Board of Conciliation and Arbitration.

About 500 workmen of the American Wringer Company, Woonsocket, R. I., went on a strike May 31, for increased pay and shorter hours. The company has raised wages twice this year and refused to grant the last demand, which was for an increase in wages and a 54-hour week in place of the 56-hour week.

There is a strike of about 300 men in the wire mill of the Waterbury Brass branch of the American Brass Company, Waterbury, Conn. The men are of several nationalities and have appointed a committee composed of two men from each race to confer with the officers of the company. Among the demands are an increase of 2½c. per hour.

About 700 employees in the Newton, Mass., shops of the Saco-Lowell Company have been on a strike demanding an increase in wages and a 9-hour in place of a 10-hour day. Some 500 returned to work June 1, accepting a compromise offered by the company of a 10-hour day, as before, 1½c. an hour increase on all wages less than 20c. per hour; 2c. an hour increase for those receiving from 20c. to 30c. per hour, and 2½c. per hour increase on all wages over 30c. per hour.

The Chicago Situation

Labor scarcity is at the bottom of Chicago troubles. No essential change has been brought about in the Chicago situation with respect to the foundries where several weeks ago the men quit work. At the McCormick and Deering works of the International Harvester Company, where the strike originally extended to all departments, the employees have returned except in the foundry. A force, perhaps 20 per cent of normal, has been gathered together but a settlement is not yet reached.

At the Illinois Malleable Iron Company's plant the men are still out and the foundry shut down. The demands of some 500 men at the Western Foundry Company for a 9-hr. day, with an increase from \$2.25 to \$3, has not been met and the men are still out though the company has offered an increase of 15c. to \$2.40, their work being almost entirely machine work. The foundry which was closed for a time is now operating with a very small force. At the Grant works of the National

Malleable Castings Company nearly 75 per cent of the men are again at work, but at its other plants the proportion is considerably less. In all this trouble there is little evidence of organization influence directing the men, but rather of a concerted effort to take advantage of the shortage of labor in forcing demands for higher wages, fostered by the suasion that is now particularly active among communities of the foreign element.

Threatened trouble at the foundries represented in the Chicago Foundrymen's Association was met with the employers' proposal of an 8-hr. day, and some contracts have been made for the year on that basis, but this has not proved entirely satisfactory. The Whiting Foundry Equipment Company has a strike on, the men asking for an 8-hr. day, which the company is not disposed to grant. Other foundries are holding their men by accepting the expedient of paying the necessary price, as high as \$2.75 per day for 10 hr. being reported. Others are paying bonuses from month to month for continuous service.

Pittsburgh and Northern Ohio

The strike of the structural iron workers in the Pittsburgh district, which started early last week, is over, the men returning to work at all fabricating shops affected at the same rate of pay and the same working hours as before.

The strike of the molders in the foundry of the Lloyd Booth department of the United Engineering & Foundry Company at Youngstown, Ohio, has been settled, the men returning to work on a 9-hr. basis with the same rate of pay as before.

The William Tod Company, Youngstown, Ohio, denies the report that it has agreed to pay its machinists an advance of 12½ per cent for a 50-hr. week. Its molders and core workers, who went out on strike some time ago, have returned to work on a 9-hr. day, with no increase in pay. The machinists employed by this company and also by other shops in the Youngstown district are still on strike, but it is believed the trouble will be settled in a short time.

Developments in Other Localities

The Industrial Commission of Wisconsin, which is investigating the hours of labor in the metal-working industries of the Middle West at the request of a group of 35 of the largest concerns in Milwaukee, has determined to conduct the inquiry almost entirely by mail. A questionnaire is being sent out by Edwin E. Witte, in charge of the inquiry. It simply relates to hours of labor and does not touch upon wage conditions. It is not the purpose of the inquiry to decide any question or dispute which may arise, nor will the investigation bind either employers or employees in the matter of the 8-hr. day.

At Elizabeth, N. J., machinists employed in 15 shops went on strike June 5 when their employers refused to grant their demands for an 8-hr. day, time and a half for overtime, double pay for holidays, and half holiday on Saturdays. Nine shops, including some of the larger ones, granted the demands. It is estimated that less than 500 men are affected.

At Berwick, Pa., June 5, announcement was made of an increase of 25 per cent in all piece-work rates throughout the Berwick car departments of the American Car & Foundry Company. The increase dates from June 1 and will affect 3000 men. The announcement also was made that a revision of day schedules throughout the car departments will soon be effected. An increase in the day rates in the rolling-mill plant, where 300 men are on strike, was announced.

Mill Basin, which is the first step in the improvement of Jamaica Bay, New York City, for industrial plants, is shortly to have facilities for shipping by rail to all parts of the country. These will be provided by building spurs to the New York Connecting Railroad and will supplement the water shipment facilities available through deep water channels to the Atlantic Ocean. An illustrated pamphlet showing the location of the development, its relation to the other parts of New York Harbor, etc., has been issued by the Atlantic, Gulf & Pacific Company, 18 Park Row, New York City.

Machinery Markets and News of the Works

NEW EXPORT RESTRICTIONS

Russia Acts to Restrict Speculation

Market Pursuing a Satisfactory Course, Despite Absence of Big-Lot Buying—Deliveries Improving Slowly

Shipments to Russia have been hampered of late by regulations which have been imposed by the Russian Government with the intention of suppressing speculation in that country, as England found it necessary to do in the latter part of last year. Before machinery can be shipped to Russia it is now necessary to file explicit data with the Russian authorities at 44 Whitehall Street, New York, most important of which is the name of the ultimate consignee. The shipper must also deposit \$50 to cover the tolls for cablegrams which the Russian officials may deem it necessary to send to Russia in connection with the shipment. England, it will be remembered, prohibited all importations except under licenses which were to be issued only to firms doing a business amounting to £10,000 yearly, and who had been so engaged for two years.

In general, the machinery market is pursuing a satisfactory course, despite the absence of big propositions. New York reports an unusually large demand for tool-room equipment, which naturally follows the installation of an immense quantity of metal-working equipment all over the country. Heavy tools are not easy to procure, a representative of the American Foundry & Machine Company, Salt Lake City, Utah, having visited several cities without success. A large boring mill, large engine lathes, open-side planer and other tools are wanted.

The Aero-Marine Plane & Motor Company, Nutley, N. J., has acquired 60 acres at Keyport, N. J., and will erect a factory for the manufacture of aeroplanes.

The Norma Company of America, 1790 Broadway, New York, has bought land at Elmhurst, L. I., and plans a large factory building. It manufactures ball bearings.

The Electric Storage Battery Company, Philadelphia, Pa., is planning an addition to its plant.

New England is more cheerful in view of the prospect that its railroad troubles are nearing an end. The Eastern Freight Accumulation Conference has been relieved of further work, and the New Haven Railroad promises normal conditions soon. Big undertakings continue to be launched in the New England States.

Domestic inquiry is improving in Cincinnati, although high prices are restricting the buying of new equipment. The General Electric Company is reported a buyer in that city.

In Chicago two or three railroads have concluded purchasing tools for which inquiries have been out for some time.

The demand for single machines and small lots is good in Cleveland, machinery houses reporting a heavy demand for lathes, radial drilling, grinding and boring machines. Deliveries show but little change, some of

the manufacturers, in fact, continuing to fall behind. In some cases cancellations for standard lathes are making such machines available for delivery in new directions.

Makers of milling machines in Milwaukee, Wis., are receiving a steady run of orders. Manufacturers in that city are keenly feeling the shortage in labor.

Production facilities are fully occupied on the Pacific coast and a general feeling of confidence pervades the territory. The Union Iron Works, San Francisco, is negotiating for land to permit of expansions.

In the Pacific Northwest there is great activity in the shipyards, many of which are building wooden vessels equipped with Diesel engines. The American Shipbuilding Company has been incorporated to build a shipbuilding plant on Puget Sound.

New York

NEW YORK, June 6, 1916.

Naturally following the purchasing in recent months of vast numbers of machine tools there is now a heavy demand for precision lathes, grinding machines and other tool-room equipment for which inquiries are increasing both at home and abroad.

Heavy metal-working equipment is difficult to procure promptly, either new or second-hand. M. Rosenblatt, of the American Foundry & Machine Company, Salt Lake City, Utah, who is at the Hotel McAlpin, New York, has visited several cities seeking several large tools without success. His company wants a 10-ft. vertical boring mill, a 42-in. open-side planer, an engine lathe with 26-in. swing, and 24 to 26-ft. bed, and a No. 3 or 4 universal milling machine. Second-hand machines would be acceptable.

The American Brass Company, Waterbury, Conn., has closed against a good-sized list of tools.

Miscellaneous business continues to hold up in a satisfactory manner, with backward deliveries still the chief source of trouble. Deliveries of some machines, on the other hand, can be made with fair promptness. Collections, on the whole, are good.

Russia continues the best export buyer, with France and Italy following closely. The demand from all these countries is more varied. While ocean freight rates are lower, it is not yet easy to secure freight room for other than government purchases. These move readily.

Shipments to private buyers in Russia now require a permit issued by officers of the Russian Government located at 44 Whitehall Street, New York. It is not only required that full details be given of the character of the shipment, the name of the ultimate consignee, and other facts, but also that a deposit of \$50 be made to cover the cost of cables sent to Russia by the Russian attache in connection with the shipment. All this procedure naturally means delay, and some shipments have been held up for weeks. Unexpected balances of the \$50 deposit are returned to the shipper, likewise he has to face an additional charge if the cable messages cost more than \$50. The whole plan is intended to eliminate speculation in Russia, as did Great Britain through the medium of her decree prohibiting the import of machine tools except under stringent restrictions.

The Carpenter Steel Company, Reading, Pa., has been placing orders for cranes and other equipment in connection with the extension of its plant.

The Norma Company of America, 1790 Broadway, New York, manufacturer of anti-friction bearings, announces the purchase of a ten-acre factory site at Elmhurst, on the outskirts of Long Island City, N. Y. The property fronts on Queens Boulevard and has a depth of about 1000 ft, abutting in the rear upon the main line of the Long Island Railroad, from which a siding will be built into the plant. Plans now under way provide for a four-story reinforced-concrete building, 70 x 350 ft., to be erected immediately. Every modern

improvement will be embodied in the plant. The architects are Francisco & Jacobus, 200 Fifth Avenue, New York. The president of the company is W. M. Nones.

The Doehler Die Casting Company, Court and Ninth streets, Brooklyn, N. Y., has awarded contract to the Standard Gas Power Company, 17 Battery Place, New York, for the construction of a one-story gas producer plant, 22 x 100 ft., to cost about \$7,500.

The American Hard Rubber Company, 11 Mercer Street, New York, is having plans prepared by Walter Kidde, 90 West Street, New York, for the construction of a three-story factory at College Point, Long Island, N. Y., 52 x 207 ft.

The Ferguson Steel & Iron Company, 1399 Bailey Avenue, Buffalo, N. Y., has completed plans for a one-story factory building, 40 x 140 ft., to cost about \$5,000.

The General Electric Company, Schenectady, N. Y., has had plans prepared for a two-story factory, 180 x 200 ft. C. G. Hueth, superintendent, is receiving bids.

The Endicott, Johnson Company, Johnson, N. Y., is starting the construction of a one-story box factory, 60 x 200 ft., to cost \$50,000. The Williams Bridge Company, Union Building, Syracuse, N. Y., is the architect and engineer. G. W. Johnson is president of the Endicott, Johnson Company.

Louis Sacks, founder, Hamburg Place, Newark, N. J., has had plans drawn by E. W. Frank Bowers, 44 Harrison Street, East Orange, N. J., for an addition to his plant to cost about \$10,000. It will be 38 x 58 ft. Sub-bids are being taken by the architect.

The National Pneumatic Action Company, 546 West Twenty-third Street, New York, is having plans drawn by F. H. Kroenigsberger, 665 Broad Street, Newark, N. J., for a two-story factory, 20 x 150 ft., to cost about \$12,000. E. G. Anderson is president.

The Bossert Company, manufacturer of sheet-metal stampings, Utica, N. Y., has let contract to Griffith & Pierce for a two-story building, 62 x 102 ft., to cost about \$25,000. It has now under construction a two-story building, 60 x 250 ft. The two buildings will add 45,000 sq. ft. of floorspace to the plant, which is running day and night with a force of 600 men, one-third of that number on night shifts. The company has announced an increase of 10 per cent in the wages to its welding department, an increase from \$4.50 to \$4.95 a day, and to all other employees a 10 per cent weekly bonus over their average wage for the past six weeks. James R. Jones is general manager and F. T. Brannigan is assistant general manager.

The Wollensak Optical Company, manufacturer of photographic shutters and lenses, Rochester, N. Y., is erecting an addition, 26 x 38 ft., one story.

The Wickes Machinery Company has been incorporated with a capital stock of \$120,000 to take over and continue the business of Wickes Brothers, Claremont and West Side avenues, Jersey City, N. J. Frank A. Fitzgerald is president. There will be no changes in the officers or management. The company manufactures and deals in a general line of power and shop equipment.

The Charlton Garage, Inc., recently incorporated, has leased a site at Sixty-fourth Street and Third Avenue, New York, upon which a garage will be erected, to be completed about Sept. 1, and have a capacity of between 300 and 400 automobiles. William Hirsch of the Lenox Garage will be president and manager. F. Osgood Pell & Co., 17 West Forty-fourth Street, New York, were the real-estate brokers.

Mark & Mohl, Inc., Third Avenue and Sixth Street, Brooklyn, N. Y., are in the market for a shearing machine of the gate type capable of cutting $\frac{1}{4}$ -in. plates 10 ft. long at a single stroke.

Valentine & Co., manufacturers of cut glass, 456 Fourth Avenue, Brooklyn, N. Y., have had plans drawn by H. Houghton, 364 Manhattan Avenue, Brooklyn, for the construction of a one-story factory, 33 x 57 ft., to cost about \$9,500. N. T. Pulsifer is president.

The Industrial Paint Works, Colt Building, Paterson, N. J., it is reported, is contemplating the erection of a three-story factory, 60 x 104 ft., to cost about \$30,000.

The Ammo-Phos Corporation, 200 Fifth Avenue, New York, is about to receive bids on the construction of a one-story chemical manufacturing building, 80 x 250 ft., to be erected at Tremley Point, near Warners, N. J., at a cost of about \$30,000.

Fries Brothers, manufacturers of chemicals, 92 Reade Street, New York, plan to rebuild two factory buildings, 42 x 50 ft., one story, 25 x 30 ft., one story, and a powerhouse, 30 x 40 ft., one story, at Orange Street and Roosevelt Avenue, Bloomfield, N. J.

The Mehl Machine, Tool & Die Company, First Avenue, Roselle, N. J., has completed construction work on its new factory, 40 x 166 ft., and will soon have it ready for operation.

The R. L. C. Specialty Company, Buffalo, N. Y., capitalized at \$50,000, has been incorporated by R. L. Cary, D. D. Cary, Buffalo, and B. J. Crawford, Gowanda, N. Y., to manufacture automobile supplies, paints, oils and household specialties.

The Contact Process Company, Buffalo, manufacturer of acids and chemicals, has let contract to the John W. Cowper Company, Fidelity Building, Buffalo, for the erection of a building for the manufacture of chemicals, 100 x 525 ft., one story, with a four-story tower, of steel frame and reinforced concrete, to be added to its plant at the Buffalo River, Lake Shore and South Buffalo railroads and the Abbott Road. The contract price was approximately \$135,000.

The Great Eastern Laundry Machinery Company, Inc., 148-150 North Division Street, Buffalo, has filed incorporation papers with a capital stock of \$250,000 to manufacture automatic laundry-folding machinery and other mechanical labor-saving devices for the laundry trade. For the present the company will have its products made by contract, and later on will establish a plant of its own. Leo M. Kohn is president and secretary.

The Aero-Marine Plane & Motor Company, office in the Times Building, New York, has acquired the Robbins brick yard property of sixty acres at Keyport, N. J., and will at once erect on it a factory, 120 x 300 ft., for the manufacture of aeroplanes. The company now operates a plant at Nutley, N. J., for the building of aeroplanes and marine motors. Winston Paul is president.

The King Sewing Machine Company, Rano Street and the Lackawanna Railroad, Buffalo, will build a brick addition to the tinning department at its plant.

The Weeks Brass Foundry Company, 850 Ellicott Square Building, Buffalo, N. Y., has taken over the plant of the Farr Mfg. Company on Schenck Street, North Tonawanda, N. Y., which it will remodel and equip as a brass foundry. Apparatus for a metal refining plant will also be installed. Alfred Weeks is president.

New England

BOSTON, MASS., June 5, 1916.

New England hopes that it is hearing the last of embargoes. The Eastern Freight Accumulation Conference was relieved of further work on May 31, as conditions had so far improved that there was no further need for its continuance. The New Haven lines on the same date sent out a letter containing many suggestions for shippers which, if followed, would operate to restore the service to normal conditions.

The Bristol Brass Company, Bristol, Conn., will increase its capital stock from \$800,000 to \$1,000,000. Two buildings in addition to those under construction will be erected, one 60 x 300 ft., and the other 60 x 200 ft. The company is very busy and has a large volume of orders booked.

The Monarch Metal Mfg. Company, Boston, Mass., has been incorporated with a capital stock of \$100,000 by Harry Sebell, George E. Jordan, Jr., and Charles M. Wheaton.

The Argonaut Salvage Company, Milford, Conn., has been incorporated with a capital stock of \$3,500,000. The incorporators are John G. Hoffman, New York; Cecil P. Ford, Hartford, and R. J. George Oliver, Milford, Conn. The company is developing the commercial submarine and salvage methods of Simon Lake, well known as the inventor of the Lake submarine. The provisions of the charter are very wide, permitting the concern to go into almost any kind of business it desires and it is reported to have ample New York capital back of it.

The American Brass Company, Waterbury, Conn., has started work on another group of factory buildings in addition to those now under construction.

Work has been started on the plant of the Keystone Stoker Company, Greenfield, Mass., and the work will be pushed to completion as promptly as possible. The factory will consist of a central section and two wings, each about 62 x 120 ft.

New Bedford Gas & Edison Company, New Bedford, Mass., has awarded a contract to the Stone & Webster Corporation for a power plant to cost about \$250,000. The main building will be 90 x 144 ft., a boiler house 85 x 166 ft., and a coal bunker 25 x 64 ft.

The new factory of the Bryant Electrical Company, Railroad Avenue, Bridgeport, Conn., is being rushed to completion by the contractors. The structure is 60 x 130 ft., five stories.

George W. Prentiss & Co., Holyoke, Mass., have awarded the contract for a new factory to be erected on Front Street, which will be 60 x 122 ft., four stories.

Work has been begun on the second large addition to the plant of the Bullard Machine Tool Company, Bridgeport,

Conn. This addition will be of reinforced concrete, 44 x 100 ft., five stories.

The Abbott Ball Company, Elmwood, Hartford, Conn., is receiving bids for a factory addition, 50 x 125 ft., one story, also a boilerhouse, 40 x 50 ft., and a switchboard room, 12 x 24 ft.

A. B. & J. Rathbone, Palmer, Mass., have awarded the contract for a two-story addition, 50 x 58 ft.

The Eagle Lock Company, Terryville, Conn., has begun the construction of an addition, 68 x 252 ft., six stories.

The Terry Steam Turbine Company, Hartford, Conn., has increased its capital stock from \$225,000 to \$250,000, the present capitalization being the figure authorized when the company was formed. The directors have also filed notice of a vote for the addition of \$100,000 in stock to the \$250,000 now authorized.

The Carr Engineering Company, Huntington, Conn., has been incorporated, with capital stock of \$10,000, to conduct a machine shop and engineering business. The incorporators are Fred E. Lacey, Stratford; Henry A. Thayer, Milford, and Samuel Karasick, Bridgeport.

The National Mfg. Company, Waterbury, Conn., has been incorporated, with capital stock of \$25,000, to deal in brass and copper. The incorporators are John P. Kellogg, Robert S. Walker and Beth Kirk.

The New York Smelting & Refining Company, Bridgeport, Conn., has been incorporated, with capital stock of \$10,000, to deal in metals. Abraham Rachaelson, Philip Nowitz and William J. Buckley are the incorporators.

The Philbrick-Booth Foundry Company, Hartford, Conn., has been incorporated, with capital stock of \$20,000, by H. B. Philbrick and H. R. Philbrick of Hartford and Thomas T. Booth of Worcester, Mass.

The Standard Oilgas Burner Company, Springfield, Mass., has been incorporated, with capital stock of \$100,000, by W. N. Lancaster, Bernard Feiner and H. Lasker.

The plant of the New England Annealing & Tool Company, 90 K Street, South Boston, Mass., was destroyed by fire May 22, with a loss of about \$15,000.

The Protectocash Register Company, Boston, Mass., has been incorporated with a capital stock of \$50,000. The directors are Atwood L. Boggs, president and treasurer; W. C. Towne and E. E. Fowler.

The Universal Tool & Machine Company, Bridgeport, Conn., has been incorporated, with a capital stock of \$3,000 to manufacture tools and machines. The incorporators are Gottfried E. Schweizer, Charles L. Smith and Albert Sutter.

Philadelphia

PHILADELPHIA, Pa., June 5, 1916.

The stringency of the labor market is now a matter of general news; but a peculiar phase of it is brought out in Lancaster, where it is reported there is now an urgent call for old men—those who have passed the age of sprightliness, who are able to do only a "boy's work." The Armstrong Cork Works is said to be advertising for old men. One of the officers stated that while such want is unusual, they are so pushed with orders they will take men of almost any age who can take boys' places, as boys are hard to get.

There are about 30,000 workers at the Eddystone plants, including the locomotive department of the Baldwin Locomotive Company, the Remington Arms Company and the Eddystone Munitions Company. With material and wages at advanced figures, the management plans to proceed slowly on its plan of making extensions to the plants.

The merger of the Bucks County and Doylestown Electric companies into the Pennsylvania-New Jersey Power & Light Company, with a capital of \$100,000 has been approved. Snyder L. Wright, 133 South Fifth Street, Philadelphia, is president of the new company, and Gaylord Thompson, of Trenton, is vice-president.

The Electric Storage Battery Company, Allegheny Avenue and Nineteenth Street, Philadelphia, which recently started the construction of an additional six-story manufacturing building, has purchased a triangular tract of land about 500 ft. long opposite its plant. The land is being cleared and work will start soon on the erection of factory buildings to cost several hundred thousand dollars.

The Hamilton Corporation, Lancaster, Pa., has been incorporated with a capital stock of \$25,000. J. W. B. Bausman, Farmers' Trust Building, Lancaster; John F. Brimmer, Charles F. Miller, J. Frederick Sener, J. Shand and H. S. Williamson, all of Lancaster, and George E. Fahys, 54 Maiden Lane, New York, to manufacture timing, speed, distance measuring and other devices and instruments, as announced in THE IRON AGE of May 18, 1916. Charles F. Miller, presi-

dent of the Hamilton Watch Company, Lancaster, is president also of the new corporation; J. Shand is vice-president; Robert E. Miller is secretary, and J. W. B. Bausman is treasurer. The board of directors is the same for both companies.

The Eastern Sheet Metals Company, Philadelphia, has been incorporated with a capital stock of \$50,000 by H. P. Felger, 1229 South Twenty-third Street; Walter W. Hess, 4914 Cedar Avenue, and H. C. Connor, 235 South Melrose Street, to manufacture sheet-metal products. John Maher, Hazleton, Pa., is treasurer. The company has taken over the three-story building and property of the Rumley Products Company, 417½ South Second Street, Harrisburg, Pa., where a jobbing warehouse will be opened in charge of C. E. Jones. The Rumley property has siding connections with the Pennsylvania Railroad and is 55 x 75 ft.

The No-Touch Straw Holder Company, Lancaster, with a capital stock of \$5,100, has been incorporated by B. Frank Weaver, Howard B. Grell and Parke E. Shee, to manufacture novelties from glass and metal.

The Modern Machine Works, Philadelphia, has been incorporated with a capital stock of \$10,000 by Samuel W. Green, 2943 North Bambrey Street; Leonard M. Wilson, 5627 Market Street; Lewis H. Swind, 4623 Wayne Avenue, and W. Clare Elliott, 5303 North Twelfth Street, to manufacture and repair machinery, tools, etc.

The National Refrigerator Company, Philadelphia, has been incorporated with a capital stock of \$10,000 by Abraham Charbrow, 38 South Water Street; Penn Charbrow and Fred Goldentyre, 3221 Turner Street, and Nathan Love, 1917 North Thirty-second Street, Philadelphia, to manufacture refrigerators and store fixtures.

The Atwood Aeronautic Company, Williamsport, Pa., has been incorporated with a capital stock of \$100,000 by William P. Beeber, Earnest H. Davis, Henry D. Brown, C. LaRue Munson, R. H. Throne, George E. Groff, A. Fischer, N. M. Edwards and George H. Dickert to manufacture aeroplanes, motor engines and aeronautical supplies and accessories.

The Reid & Pancoast Company, Philadelphia, has been incorporated with a capital stock of \$10,000 by F. R. Hansell, Philadelphia; George H. N. Martin and S. C. Seymore, of Camden, N. J., to manufacture machinery, tools and scientific instruments. Edwin A. Pancoast, Fifth Street at City Line, Philadelphia, is treasurer.

The Littlestown Hardware & Foundry Company, Littlestown, Pa., has been incorporated with a capital stock of \$5,000 by Luther D. Snyder, Emory H. Snyder and Sheldon K. Abel, all of Wrightsville, Pa., to manufacture light castings, toys and specialties.

The Sun Shipbuilding Company, Philadelphia, has been incorporated with a capital stock of \$100,000 by E. W. Nittinger, 2462 North Nineteenth Street; Frank M. Brown, 5427 Walnut Street, and William H. Booth, Nineteenth and Hyatt streets, to build and repair ships, machinery, engines, etc.

The board of public grounds and buildings, Harrisburg, Pa., will receive bids until noon, June 13, for a laundry building and powerhouse at the State Institution for the Feeble Minded at Polk, Pa., destroyed by fire Oct. 16, 1915. Plans and specifications may be seen at the institution, or at the Capitol. Separate proposals will be received for laundry building, boiler and powerhouse, laundry machinery, powerhouse machinery, plumbing, heating, ventilating and electrical work.

The Magnetic Pigment Company, Cass Street, Camden, N. J., is reported to be having plans drawn for an addition to its factory, one and two stories, 40 x 45 ft., to cost about \$4,500. L. C. Hunt, 114 East Montgomery Street, Trenton, is the architect. Bids will probably be taken shortly.

Ballinger & Perrot, Seventeenth and Arch streets, Philadelphia, have drawn plans for an additional manufacturing building, four stories, 91 x 274 ft., for the Victor Talking Machine Company, Camden, N. J.

The Adder Machine Company, Kingston, Pa., has let contract to John Curtis & Co., Hill and Hickory streets, Wilkes-Barre, Pa., for the construction of a two-story machine shop extension, 81 x 115 ft., to cost about \$25,000. Sturtevant & Poggi, Coal Exchange Building, Wilkes-Barre, are the architects.

Bids will be received until 2 p. m., June 16, by S. T. Atchley, superintendent of the New Jersey State Hospital, Trenton, N. J., for an addition to the powerhouse, one story, 30 ft. square and 50 ft. square, to be erected from plans by George S. Drew, State architect, at a cost of about \$85,000.

Bids will be received until June 15 by R. Fellembaum, town clerk, Mount Joy, Pa., care of the First National Bank, for the erection of a one-story pumping station to be erected at a cost of about \$2,500. It will be 40 ft. square and will be erected under the supervision of F. H. Shaw, Drineman Building, Lancaster, Pa.

The C. B. Porter Company, manufacturer of tinware, cans, stove boards, etc., 128 North Second Street, Philadelphia, is erecting a building 25 x 140 ft., principally for warehouse purposes.

The National Rubber Company, Pottstown, Pa., has purchased additional property on Third and Charlotte Streets. It has already purchased an entire square, on which it is erecting a factory.

Chicago

CHICAGO, June 5, 1916.

The Chicago & Northwestern Railway and its associated line, the Chicago, Minneapolis, St. Paul & Omaha have about completed their purchases of tools for which they have been in the market in the last month. The Chicago, Burlington & Quincy has also placed its orders for several of the machines for which it made inquiry. Buying of a miscellaneous character has been rather better in the past week, though to this fact there attaches no special significance. The Fort Wayne Electric Company purchases for its new factory were made at Schenectady and this market participated only in a very small way. A local manufacturer of motor trucks was a buyer of a number of tools last week. Inquiry from Canada has not been conspicuous for some time with respect to individual orders or inquiry, but a fairly steady buying by manufacturers other than munitions makers is being maintained. General conditions as to deliveries are slowly bettering themselves.

The Alemite Metal Company, Chicago, has moved its plant to 341-351 West Chicago Avenue, where it will install modern machinery throughout.

The National Iron Works, Chicago, has changed its name to Reuter Brothers, and moved its plant to 5814 South Wood Street.

The Advance Tool Works, Chicago, have removed to their new factory at 2300 Warren Avenue, at the corner of Oakley Boulevard. The larger quarters are an indication of the growth of the company's business.

The Central Metallic Door Company, 2412 West Twenty-second Street, Chicago, recently incorporated, has completed the equipment of its shop, having installed a full line of sheet metal-working tools.

The Englander Spring Bed Company, Thirty-ninth Street and Lowe Avenue, Chicago, will shortly occupy a new factory, to be built for it by W. C. Griswold.

Templeton, Kenly & Co., Ltd., 1020 South Central Avenue, Chicago, manufacturer of railway supplies, is preparing plans for an addition to its factory.

The Lyon Metallic Mfg. Company, Yorkville, Ill., near Aurora, manufacturer of metal lockers, is building an addition to its factory, 100 x 160 ft., at a cost of \$15,000.

The Havana Metal Wheel Company, Havana, Ill., is adding a new building for storage purposes to relieve congestion in other parts of the factory and provide room for expanding manufacturing operations.

The Universal Welding Company, St. Anne, Ill., manufacturer of wire wheels, had its plant destroyed by fire. W. J. Reiman is the owner and president.

At Fort Dodge, Iowa, bids are being received on a new water power plant, to include the building of a dam and power house for the installation of turbines and generators.

The Blackhawk Furnace Company, Waterloo, Iowa, has been recently organized for the purpose of manufacturing steel furnaces.

The Globe Mfg. Company, Perry, Iowa, H. C. Dilenbeck, president, has completed its plans for the building of a factory to replace the one destroyed by fire. The new shop is to be a two-story building, 100 x 150 ft. It will include a machine shop, wood-working shop and boiler house.

The Four Wheel Drive Mfg. Company, Minneapolis, Minn., David W. Henry, president, has purchased the factory buildings of the Nott Fire Engine Company and expects to inaugurate operations at once in the manufacture of trucks ranging in capacity from two to four tons.

Indianapolis

INDIANAPOLIS, IND., June 5, 1916.

The Vulcanite Roofing Company, Anderson, Ind., has under way an expansion of its buildings and machinery equipment which will involve an expenditure estimated at \$50,000.

The Fulton Tractor Mfg. Company, Anderson, Ind., has taken over a plant in that city which it will adapt for the manufacture of farm tractors and possibly motor vehicles. The company was recently organized with a capital of \$300,000.

The Oakes Company, Indianapolis, Ind., has prepared

plans and is about to award contracts for the erection of an addition to its plant, to cost \$25,000, which will add about 20,000 sq. ft. for the manufacture of pressed steel automobile parts.

The LaPorte Foundry & Furnace Company, LaPorte, Ind., has been organized with a capital of \$50,000. The directors are George W. Gilderman, W. N. Rumely, A. J. Rumely, C. E. Wolfe and A. J. Hickett.

The T. W. Warner Company, Muncie, Ind., manufacturer of automobile parts, has had plans prepared for the erection of an addition to its plant, 85 x 125 ft., for which it contemplates the purchase of new machinery.

Thomas Walsh has acquired control of the plant of the Madison Machine Company, Madison, Ind.

The Lindley Box & Paper Company, Marion, Ind., has been incorporated with \$125,000 capital stock to manufacture paper products. The directors are L. R. Lindley, F. V. Powell and H. H. Lindley.

The J. O. Clarke Tank Company, Crawfordsville, Ind., has increased its capital stock from \$15,000 to \$30,000.

The T. W. Warner Company, Muncie, Ind., manufacturer of automobile parts, will erect an addition to its plant.

The contract for the construction of the Pennsylvania freight yards at Indianapolis has been awarded to the Duinn-McCarthy Company, Chicago. The roundhouses and other terminal facilities will cost \$1,726,096.

Milwaukee

MILWAUKEE, WIS., June 5, 1916.

The acute stage in the shortage of labor is the most pronounced feature of the situation at this time. It is practically impossible to obtain skilled help of any kind, especially machinists. The steady run of orders received by milling machine and other machine-tool builders is keeping operations at the utmost capacity, even with extensions recently made, and many more men could be used if they were available. Outside metal-working concerns are bidding with local industries for skilled help, but this market is as bare as others, and even inducements of wage premiums do not bring the desired result. As to the question of an 8-hr. day, the matter has been deferred pending the inquiry into conditions in competitive industries elsewhere and the machinery industry here is quiet and peaceful for the present. Foundries are maintaining the high mark of production of the last six months and some are even turning away orders. Casting shops which have installed electric furnaces are almost unable to handle requirements for electric steel and some are replacing the initial installations with large capacity furnaces. Milwaukee building operations so far this year are \$1,800,000 in excess of a year ago, although May fell slightly below the same month of 1915. The high prices of all kinds of building material, especially steel, has had the effect of deferring some projects of considerable size in anticipation of a more favorable market.

The Mayer Brothers Company, Antigo, Wis., which recently took over the plant of the defunct International Hoist Company at Antigo, has added the manufacture of power hammers to its other lines, consisting of hoists and paper-baling presses. The first two hammers are being built for the company's own purposes, but a regular production is planned. The hammer is designed for general blacksmith and machine shop use. The company has installed two new electric traveling cranes and much other equipment in its foundry and machine shop, and is now prepared to do a great variety of custom casting.

Fred Maettig, architect, 2906 North Avenue, Milwaukee, is in charge of plans and erection of a \$25,000 factory and garage, 40 x 100 ft. and 30 x 60 ft., on which bids will be taken July 1. The owner's name is withheld.

The Kissel Motor Car Company, Hartford, Wis., has completed work on a new three-story building, 84 x 320 ft., and will at once erect another three-story shop, 72 x 316 ft. Plans are also being prepared for a new administration building, four stories. Approximately \$100,000 is being expended.

The Milwaukee Tank Works, 156 Clinton Street, Milwaukee, has leased a five-story manufactory building at Kinnickinnic Avenue and Becher Street, and will move its plant as soon as alterations are completed. R. L. Bienenstock is president.

The Fond du Lac Church Furniture Company, Oak Street, Fond du Lac, Wis., will erect a three-story addition, providing 60,000 sq. ft. of floor space, including offices. Foundations will be of sufficient strength to carry three additional stories. A large list of wood-working machinery will be required. William Mauthe is president.

The Green Bay Packing Company, Green Bay, Wis., incorporated with a capital stock of \$250,000, as noted, has

engaged Washington & Knehan, architects, Chicago, with P. T. Benton, Green Bay, as associate, to plan the construction of a packing and cold-storage plant costing in excess of \$200,000. It is planned to take bids late in July.

The Auto Parts Mfg. Company, 528-532 Broadway, Milwaukee, has increased its capital stock from \$35,000 to \$50,000. No important improvements are planned, but the company is gradually expanding.

The Malleable Iron Rang. Company, Beaver Dam, Wis., maker of stoves and ranges, is erecting an office building, 70 x 165 ft., and has completed a new shop building, containing a battery of new ovens.

A report from Beaver Dam, Wis., says that the Western Malleables Company, operating the former properties of the defunct Beaver Dam Malleable Iron Company, is about to start operations in the South Street plant, which has been idle for more than two years. The company has orders on its books to insure full operations for at least eight months and new business is coming daily. Much work is being received from the automobile industry, although the railroads are fair buyers of the plates and other railroad malleable castings. E. E. Smythe is general manager.

The Thom Automobile Company, Oshkosh, Wis., has broken ground for its new garage and machine shop, which embodies the old garage. The dimensions will be 112 x 164 ft., two stories and basement, and will cost \$45,000.

Schroeder Brothers, Milwaukee, are contemplating the establishment of an automobile body plant in Dodgeville, Wis.

The Dotti Mfg. Company, Madison, Wis., manufacturing spring and frame supporters, has incorporated its business with a capital stock of \$12,000. Joseph Dotti is president.

The Milwaukee Washing Machine Company has been incorporated by Milwaukee interests. The capital stock is \$35,000 and the incorporators are A. H. Ward, W. Erwin and O. Kroesing.

The Merton Dairy Products Company, Merton, Wis., is in the market for motors, generators and other electrical equipment for its new plant now under construction at a cost of \$20,000. A. E. Swager, Milwaukee, is the architect.

The Davis Mfg. Company, Milwaukee, an extensive manufacturer of gasoline motors, has increased its capital stock from \$300,000 to \$500,000 to accommodate its increasing business. The company recently took occupancy of its new plant at Fifty-seventh Avenue and Mitchell Street, West Allis, erected at a cost of more than \$250,000. Frank M. Davis is president and chief engineer.

The Laursen Automatic Pump Company, which recently moved from Eau Claire, Wis., to Menomonie, Wis., is preparing to establish a branch plant at Green Bay, Wis., to accommodate the overflow of orders for mining and irrigation pumps. It has leased the two remaining structures comprising the plant of the defunct Hess Iron Works at Green Bay, and will add equipment to supplement that now in the works. C. A. Straubel, trustee of the Hess Iron Works; George D. Nau and J. R. Meyers, all of Green Bay, are stockholders in the Laursen company.

The Badger Wire & Iron Works, 687-691 Muskego Avenue, Milwaukee, has awarded contracts for the erection of an addition, 105 x 140 ft., one-story and basement, to cost \$20,000. The steel work has been taken by A. F. Wagner.

Bids for the erection of a \$125,000 high school and manual training institute at Manistique, Mich., from designs by Robinson & Campau, Grand Rapids, Mich., at a cost of \$125,000, will be taken until June 8 by Alice Hargraves, secretary of the board of education.

The Spring City Auto Company, Waukesha, Wis., which lost its garage by fire several weeks ago, has arranged to take over the new garage of the Carpenter-Freyer Auto Company.

Ira Ludwig, Milwaukee, has been granted a permit to build a garage and repair shop at Nineteenth and Center streets, of reinforced concrete, 45 x 105 ft., to cost \$10,000.

The La Crosse plant of the Wisconsin & Minnesota Light & Power Company, which was destroyed by fire on May 25, causing a loss of \$75,000, will be rebuilt and re-equipped at once.

The Racine Foundry Company, 930-940 Tenth Street, Racine, Wis., maker of gray-iron castings, which closed down several weeks ago, has resumed operations. R. B. Birdsall is president and Horace Simms superintendent.

Demars Bros., operating the Service Garage at Washburn, Wis., will build a 20 x 50 ft. addition, to be used for machine shop purposes.

The Jersild Fire Escape Company, Neenah, Wis., probably will establish its permanent works at Waupaca, Wis., local capital having agreed to invest about \$20,000 of the capital required. The former felting mills group will probably be provided as factory quarters, and will require a complete equipment of machinery and tools for structural steel work. J. N. Jersild is president and general manager.

Cleveland

CLEVELAND, OHIO, June 5, 1916.

A good demand exists for single machines and small lots of tools, notwithstanding the fact that many users, in view of delayed deliveries and prevailing prices, are buying only what they absolutely need. Local machinery houses report the demand heaviest for lathes, radial drills, grinding machines and boring machines. Deliveries show little change. Some manufacturers are getting further behind, although an occasional cancellation for standard lathes makes a machine available for prompt shipment. Better delivery dates are being promised on standard multiple spindle drills than a few weeks ago, but a local maker of drilling machines is sold up until next February on special machines used in the automobile trade. The domestic demand for turret lathes continues heavy, coming from about all classes of users.

The Ohio Steel Foundries Company, Lima, Ohio, has purchased the steel foundry of the Bucyrus Steel Castings Company, Bucyrus, Ohio, and will operate it as a branch plant. It is stated that it will be enlarged by the erection of a large wing, a fireproof pattern house, office building and cleaning department. The purchase does not include the adjoining plant of the Carroll Foundry & Machine Company, an allied interest of the Bucyrus Steel Castings Company. C. W. Lytle, formerly with the American Steel Foundries, Sharon, Pa., and recent manager of the National Steel Foundry, Milwaukee, has been made manager of the Bucyrus foundry.

The Crucible Steel Forge Company, Cleveland, is in the market for one or more direct-connected motor-driven engine lathes, 25 ft. between centers and with a 40-in. swing. Two carriage machines are preferred.

The Denneen Motor Company, Cleveland, has acquired the old car shops of the Cleveland Railway Company, Colman Road and East 123rd Street, which will be used as a temporary location for assembling motor trucks.

The Thomas & Armstrong Company, London, Ohio, maker of sheet-metal products, will increase its capital stock from \$75,000 to \$150,000, and plans the erection of additional buildings to take care of its increased business.

The Universal Machine Company, Bowling Green, Ohio, will add \$75,000 to its capital stock to provide for the erection of plant additions.

The General Tire & Rubber Company, East Akron, Ohio, is erecting an addition to its plant, 40 x 75 ft.

It is announced that the Wooster and Canton, Ohio, plants of the Hinderer Brothers, pattern makers and manufacturers of steam and hot-water boilers, will be consolidated as the Canton Pattern & Foundry Company, and will erect a plant in Canton. The foundry will be one story, 60 x 85 ft., and the pattern building, two stories, 50 x 60 ft., both of brick and concrete.

The Berger Mfg. Company, Canton, Ohio, has decided to proceed at once with about one-half of the proposed improvements recently announced. These will include extensions to its galvanized and black sheet departments. It is stated that the work will be started as soon as contracts can be placed and will involve an expenditure of about \$150,000.

The Mazuria Clay Products Company, Urichsville, Ohio, has been incorporated with a capital stock of \$100,000 and will erect a plant to manufacture clay products.

Detroit

DETROIT, MICH., June 5, 1916.

The England Mfg. Company, Detroit, has acquired a three-acre factory site at Leavitt and Campbell avenues and has broken ground for a new plant. It manufactures automobile parts.

The Michigan Copper & Brass Company, Detroit, will erect a one-story shop, 72 x 83 ft., to cost \$10,000.

The Argo Motor Company, Jackson, Mich., has acquired a large factory site on which a new plant will be erected at once. Mansell Hackett of Detroit is president and general manager. The plant now occupied will be used by the Detroit Chassis Company, which will remove its business from Detroit to Jackson.

The O. E. Williams Aeroplane Company, Fenton, Mich., has been incorporated with \$25,000 capital stock and will probably erect a factory at Fenton to manufacture aeroplanes. O. E. Williams is the principal stockholder.

The Detroit Shipbuilding Company, Orleans Street, has broken ground for improvements which will cost about \$35,000. Extensions will be made to the machine shop, boiler shop and scratching room.

G. L. Howlett, of the Industrial Works, Bay City, Mich., has purchased the plant and business of the M. Garland Machine & Foundry Company, Bay City.

The W. O. Lee Company, Port Huron, Mich., manufac-

ture of injectors and brass goods, is making arrangements to double the capacity of its plant.

Howen & Sehler, Grand Rapids, Mich., manufacturers of harness, have broken ground for a new plant, 80 x 116 ft., five stories.

The Eagle Iron Works, Muskegon, Mich., has acquired the plant of the Bradley & Ankebrandt Company, manufacturer of cast-iron plumbing and steam goods, and will operate both plants.

The Home Furnace Company, Holland, Mich., previously referred to as the Home Heating Company, advises that plans have been completed for the early erection of a factory for the manufacture of heating furnaces. The company will be in the market for foundry machinery and sheet metal tools.

The Goodale Company, founder and maker of match plates, Kalamazoo, Mich., is about to begin the operation of its new plant, including machine shop and one-story foundry, all the equipment of which is motor driven.

Cincinnati

CINCINNATI, OHIO, June 5, 1916.

A representative of the General Electric Company was in Cincinnati last week and visited several machine tool plants, and it is rumored that his visit precludes the purchase of quite a lot of equipment by that company. While the domestic inquiry for machine tools is improving, purchases are rather slow, and it is stated that the present high costs of both material and labor have forced up prices to a point where many prospective customers are overhauling old equipment and postponing buying any new tools. Quotations on second-hand machinery of all kinds have eased off some. The foreign demand is very slack, with the possible exception of Canada; lately several inquiries have been received from Canadian firms for prices on large-sized lathes.

A very encouraging feature just now is the good demand for portable electric drilling and grinding machines. This call for electric tools is general, and includes several shipments to the Pacific Coast. Quite a lot of business has also been received from Russia in the past 30 days, but shipments to England and France have been reduced.

Builders of fire engines are very busy, and lately the Ahrens-Fox Fire Engine Company, Cincinnati, reports the receipt of an order from the city of Havana, Cuba, for nine large units. Makers of sugar machinery are also receiving some large contracts from Cuba.

The Laidlaw Dunn Gordon Company is now operating its machine shop at full capacity with more than three-fourths of its former force of machinists.

The French Brothers-Bauer Company, Cincinnati, is asking for bids on a refrigerating plant, 127 x 225 ft., four stories, of reinforced concrete.

The United States Can Company, Norwood, Ohio, has had plans prepared by Tietig & Lee, architects, for a brick addition to its plant, 36 x 80 ft. An office building will also be constructed.

The Chesapeake & Ohio Railroad Company has let contract for a boilerhouse and an addition to its machine shops at Silver Grove, Ky., near Cincinnati.

The Hooven, Owens, Rentchler Company, Hamilton, Ohio, has purchased the building on North Fourth Street now occupied by the Phoenix Caster Company and will fit it up as a pattern shop. An addition is planned for storage purposes.

The Computing Scales Company, Dayton, Ohio, has purchased a site adjoining its plant on which it will erect a foundry and factory addition.

The Excell Mfg. & Sales Company, Springfield, Ohio, recently organized by J. B. Gaines and others, is fitting up a plant for the manufacture of a patented lawn sprinkler.

Work on the new plant of the Blackwood Steel Castings Company, Springfield, Ohio, is now well under way, and the buildings are expected to be ready for the necessary equipment by Aug. 1.

The Kilbourne & Jacobs Mfg. Company, Columbus, Ohio, is making some large shipments of industrial railroad cars, as well as wheelbarrows, to Central and South America.

The new addition to the plant of the Ohio Malleable Iron Company, Columbus, Ohio, is now well under way. The building is estimated to cost \$60,000, and considerable equipment will be required, most of which has already been purchased.

The Boos Machine Company, St. Mary's, Ohio, has been incorporated with \$50,000 capital stock by G. F. Boos and others. Nothing is known as to manufacturing plans.

It is currently reported that the Pennsylvania Railroad Company is contemplating doubling the size of its repair shops at Richmond, Ind., at an estimated cost of \$500,000.

Baltimore

BALTIMORE, MD., June 5, 1916.

The Autogeneous Welding & Equipment Company, Baltimore, has been incorporated with \$50,000 capital stock to manufacture machinery. Herman T. W. Heimiller, 22 East Lexington Street; Edward F. Hoffman, Ernest Warner and Morrill N. Packard are the incorporators.

Dobos & Schlutter, Inc., Baltimore, has been organized with \$10,000 capital stock to manufacture iron, brass and other metals. George H. Schlutter, 1132 Harford Avenue; Ernst Dubos and Karl A. M. Scholtz are the incorporators.

The Chesapeake Mfg. Company, Light and Poultny streets, Baltimore, manufacturer of furniture, will establish a plant at Sharp and Barre streets.

A garage and repair shop will be established on Morton Street near Mount Royal Avenue, Baltimore, by the Monumental Motor Car Company, Howard and Franklin streets.

The Baltimore & Ohio Railroad Company, Baltimore, has asked for bids on a new pier to cost about \$650,000, to be erected at its export terminal at Locust Point, Baltimore.

The Chemical Pigments Corporation, St. Helena, Md., has been incorporated with \$265,000 capital stock, by F. R. Hansell, Philadelphia; George H. B. Martin, Camden, N. J., and Wilton Snowden, Jr., 34 Central Savings Bank Building, Baltimore, to manufacture pigments and chemicals. It is understood a plant will be built at St. Helena.

Birmingham

BIRMINGHAM, ALA., June 5, 1916.

Increasing adaptation of electricity to plants heretofore using steam renders electrical apparatus persistently active. As a rule business is characterized by a fair demand all around and conditions generally satisfactory.

The Lindsey Lumber & Export Company, Mobile, Ala., of which M. Lindsey is president, is building a lumber mill of 100,000 ft. daily capacity, to be equipped with \$60,000 worth of machinery.

The Augusta Vitriified Shale Brick Company, Augusta, Ga., has been incorporated with a capital stock of \$100,000 to manufacture brick, tile and pipe. John C. and W. K. Hagler, Augusta, and J. I. Hankinson, Aiken, S. C., are stockholders.

The Central South

LOUISVILLE, KY., June 5, 1916.

The machinery trade continues busy and in some instances, it is reported, raw materials are now more easily obtained. Re-orders for farm implements are coming in, but they are proving exceedingly difficult to fill, and the trade is seeking to substitute sizes which are available to take the place of those impossible to secure. Many retailers underestimated their requirements.

The Louisville Wagon Mfg. Company is increasing the capacity of its automobile department 25 per cent and will soon be in the market for additional machinery. Further extensions are likely.

Chess & Wymond, Louisville, will enlarge and add to the equipment of their veneer mills at Holly Ridge, La. L. H. Wymond is president and C. S. Wymond secretary and treasurer.

It is stated that the Edward Hines Lumber Company, Chicago, will establish a sawmill in the vicinity of Gulfport, Miss., which will give employment to 1500 workmen.

James P. Lewis, Secretary of State of Kentucky, will receive bids from June 15 to 20 for supplying the State with 30,000 automobile and motorcycle license tags for the year 1917. Specifications may be obtained from the office of Secretary of State or the Commissioner of Public Vehicles, Frankfort, Ky.

Sam King will replace the garage recently burned at Maysville, Ky., by a corrugated steel building, 60 x 115 ft.

The Owensboro Auto-Arc Company, with \$10,000 capital, has been incorporated by W. H. Brannon, J. W. McCulloch, E. T. Franks, T. A. Pedley, and others, and plans to establish a plant.

Mayfield, Ky., will issue \$200,000 of bonds to purchase the plant and property of the Mayfield Water & Light Company.

The Durham Coal & Iron Company announces that it will rebuild the tipple and washing plant at Soddy, Tenn., recently burned with a loss of \$100,000.

The Public Light & Power Company is rebuilding its hydroelectric plant at Manchester, Tenn., on the Duch River.

The Safety Automobile Light Company, Knoxville, Tenn., has been organized with \$25,000 capital stock, and contemplates a plant to manufacture a special lamp for automobiles. J. G. Buchanan, A. M. Treadwell, and others, are the incorporators.

Installation of a high-efficiency prime mover and generator of 500 hp., and electrically driven pumps of about 1,000,000 gal. daily capacity, is being considered by the Columbia, Water & Light Company, Columbia, Tenn. J. S. Robinson is secretary and superintendent.

W. T. Downing, Atlanta, has plans for a six-story addition to the plant of the Chattanooga Warehouse & Cold Storage Company, Chattanooga, Tenn., estimated to cost \$70,000.

St. Louis

ST. LOUIS, Mo., June 5, 1916.

While the machine-tool business seems to continue up to the capacity of the dealers and manufacturers an improvement is noted in deliveries. This is encouraging dealers to seek business rather than wait for it to come to them. In second-hand tools the supply continues as short as ever and no equipment is permitted to remain long on the floor. New enterprises continue to be established and their wants are filled with reasonable promptness.

The Mississippi Valley Motor Company, St. Louis, has been incorporated with a capital stock of \$25,000 by E. A. Hatfield, F. W. A. Vesper and Fred Campbell to establish a garage and machine shop.

The Western Stamping Company, St. Louis, has been incorporated with a capital stock of \$12,000 by Victor H. Handschue, Alvine Sale and C. A. Hightower to manufacture metallic lamps, lanterns, etc.

The Republic Motor Truck Company, St. Louis, has been incorporated with a capital stock of \$20,000 by W. L. Murphy, B. W. Hilgard and L. E. Fischer, and will equip a machine shop and garage.

The American Water Heater Company, St. Louis, has been incorporated with a capital stock of \$250,000 by W. F. Stewart, L. B. Mettler and Gunther Meier and will equip to manufacture water heaters.

The St. Louis Electrical Works, 5410 Easton Avenue, St. Louis, has acquired new quarters to which it will remove, shortly, more than doubling the capacity of its present plant. It will manufacture a lighting device for automobiles. S. A. Whitten is president.

The C. Heinz Stove Company, St. Louis, has acquired new and larger quarters in which it will install additional stove-making equipment.

The Ziegler & Peters Electric Company, St. Louis, has been incorporated with a capital stock of \$12,000 by E. C. Ziegler, John W. Peters, Jr., and others, to manufacture electric fixtures.

The National Security Envelope Company, Kansas City, Mo., has been incorporated with a capital stock of \$50,000 by J. R. Sutter, C. C. Rogers and W. W. Brady, and will equip to manufacture a special envelope.

The Doe Run Lead Company will equip a power plant to cost about \$250,000 at Rivermines, Mo., under the direction of Velle, Blackwell & Buck, 49 Wall Street, New York City.

The Adirondack Mining & Milling Company, 31 McKinley Building, Joplin, Mo., is in the market for one 150-hp. high-pressure boiler, direct-connected electric lighting generator, oil engine, etc. W. H. Roberts is manager.

The Allen Mop Company, Kansas City, Mo., has been incorporated with a capital stock of \$12,000 by M. P. Allen, William C. Perry and Herbert Lee, and will equip a manufacturing plant.

Princeton, Mo., will improve its electric light and water-works plant by installing new engines, boilers, etc.

The Water Company, Jefferson City, Mo., will equip an addition and install additional pumping equipment.

G. W. Whitcomb, Kansas City, Mo., Twelfth and Bellefontaine streets, will equip a factory, 50 x 124 ft., to manufacture bank and office fixtures. Wood-working machinery is wanted.

The Foreman Light Company, Foreman, Ark., will equip an electric light and power plant of about 50 hp. capacity and requiring about \$4,000 worth of machinery. R. B. Bryant, C. B. Cook and T. F. Hughes are stockholders.

The J. H. Phipps Lumber Company, Fayetteville, Ark., has increased its capital stock from \$250,000 to \$400,000 and will extend its mill equipment.

The Rockwell Mfg. Company, Camden, Ark., will equip a wood-working plant to manufacture screen doors, etc. It will also equip a crate factory at Thornton, Ark. John F. Judd, is president.

Newkirk, Okla., has voted \$250,000 to build a double gas pipe line with pumps, etc., from the Newkirk field. C. S. Miller, mayor, can be addressed.

The Getty Oil Company, Tulsa, Okla., has been incorporated with a capital stock of \$250,000 by J. Carl Smith, Tulsa, Okla., and George F. and J. Paul Getty, Los Angeles, Okla., and will be in the market soon for equipment.

H. W. Hartsaw and others, of Bristow, Okla., have organized a company to manufacture a patented lightning arrester. About \$10,000 worth of equipment will be bought.

The Ardmore Railway Company, Ardmore, Okla., will equip car shed and repair shops at Ardmore.

The Bolinger-Franklin Lumber Company, Koscusko, Miss., is in the market for rehaul skidder equipment and is asking proposals for two-line equipment. It is also installing a complete two-band mill, boilers, engines, electric light machinery, etc.

The city commissioners of Clarksdale, Miss., are in the market for one 500 kw. alternating current turbo generator, with 125-volt exciter, direct-connected; 200-kw. direct-connected uniflow engine and generator with 125-volt exciter, and other equipment. About \$20,000 is to be expended.

The Glenmora Light & Power Company, Glenmora, La., will equip an electric plant to cost about \$7,500.

Texas

AUSTIN, TEX., June 3, 1916.

Prospects for a record-breaking cotton crop is causing a big demand for cotton-ginning machinery. The Mexican situation is having no apparent effect upon the business in the border states. Irrigation pumps, engines and other equipment are in demand in South Texas, where there has been a shortage of rainfall in the last few months. The machinery and tool trades continue in very satisfactory condition, somewhat better than it was a few weeks ago.

It is officially announced that the defunct Government of Mexico will construct an oil refinery at Tampico, and go into the business of producing and refining oil.

S. H. Dunlap, Ennis, and associates, will build a 40-ton cotton-seed oil mill and a cotton gin.

The Oil City Brass Works, Beaumont, will construct a brass foundry and machine shop.

The Port Arthur Planing Mill, Port Arthur, will build a planing mill to cost about \$15,000.

Robert Ligon, Iowa Park, Tex., has taken steps toward constructing an oil refinery at El Paso to cost about \$50,000.

The Texas Southern Traction Company and the Texas Traction Company have been merged into a new company, called the Texas Electric Company, which plans to extend the Dallas-Waco line to Austin, a distance of 100 miles.

The Carthage Cotton Oil Company will construct a cotton-seed oil mill at Carthage to cost about \$20,000.

The Southland Cotton Oil Company will rebuild its cotton-seed oil mill at Waxahachie, which was recently destroyed by fire, entailing a loss of \$75,000.

The Interstate Electric Corporation, Ballinger, plans to make improvements to its electric light and power plant to cost about \$100,000. Besides installing new machinery it will construct transmission lines to near-by towns.

The Cummer Mfg. Company, Paris, will install machinery for manufacturing veneers in its box and crate factory.

The Moore-Schillinger Company, Inc., El Paso, will build a plant for manufacturing ornamental iron and wire work.

The People's Gin Company, Bristol, will construct a cotton gin to cost about \$8,000.

George G. Lemons of London, England, and associates, plan to build a customs smelter at Prescott, Ariz., to cost about \$1,500,000. The chamber of commerce, Prescott, is assisting in the preliminary work.

San Francisco

SAN FRANCISCO, CAL., May 29, 1916.

No new lists of importance are appearing, and the demand for metal-working tools has been a little less urgent the last few weeks, though single-tool sales show a very healthy activity. General shop operations are on as large a scale as for some time past, and all new equipment installed is fully occupied. A feeling of confidence that the industries of this district are not being over-developed is quite general, and also that the present increase of business will be held permanently.

Shortage of rain for the last few months has brought a strong renewal of demand for irrigation machinery, especially for small units. Some new development of hydroelectric power is being made. Motors and oil-burning power units

are in strong demand in the mining districts. Wood-working machinery shows a normal activity, and the call for road-building equipment is as good as for several years past.

The shortage of grain sacks has started a movement in California to handle grain in bulk, and many elevators are being built.

A large electric pumping installation is soon to be placed in the Allison Ranch group of mines near Grass Valley, Cal., M. Brockington, superintendent.

Edwin Forrest, operating a forge shop on Fremont Street near Mission, is taking on additional space and will install a 2000-lb. steam hammer. The shop makes a specialty of oil-well tools.

The Petaluma Foundry, Petaluma, Cal., recently taken over by the Corliss Gas Engine Company, is to be enlarged.

Four 40-ton derricks are to be installed on a new wharf at Adeline Street, Oakland.

The San Diego Fish Company, San Diego, Cal., is preparing to build a refrigeration plant.

Bids will be opened this week for an engine lathe, saw table and mortising machine for the high school, Wilmington, Cal.

The West Side Irrigation District, Tracy, Cal., is working on a project calling for the installation of centrifugal pumps to handle a stream 3 ft. or more in diameter.

It is estimated that nearly \$2,000,000 will be spent in building gold dredges in Shasta and Trinity counties, Cal., within the next year.

The Union Iron Works is negotiating for additional land on the Alameda waterfront for the expansion of the ship plant recently purchased from the United Engineering Works.

The Pacific Northwest

SEATTLE, May 29, 1916.

The 1916 season has established a new record for shipbuilding in the Northwest. From every section comes the report that every plant is running to capacity, is behind in its orders, and this condition promises to continue indefinitely. New plants are being constructed at many points on Puget Sound and the Columbia River, and many of them have orders booked which will keep them running for months to capacity. Dealers report that irrigation equipment is in brisk demand. Several large orders have been booked the past week.

According to official figures, almost \$1,000,000 per day in exports alone, or more than \$6,000,000 in excess of all previous high marks, is the record in ocean-borne commerce for the Puget Sound district. Iron and steel manufactures lead all other exports, these having a value of \$4,410,879, combined imports and exports during the month amounting to \$39,661,248.

The American Shipbuilding Company, Spokane, Wash., has been incorporated for \$1,500,000 and has elected H. B. Spear, president and general manager; R. C. Sweatt, vice-president, and J. B. McCoy, secretary and treasurer. It plans the construction of a shipbuilding plant on Puget Sound, three cities having made bids for the plant. The yards will have 1500 ft. frontage by 600 ft. depth, and will admit of the construction of 15 vessels at one time. The plant will include a ship shed, blacksmith shop, foundry, machine shop, mold loft and wood-working shop. The company plans to build sailing vessels, 310 ft. long, equipped with semi-Diesel Skandia engines. Already five vessels have been chartered to be built.

The Census Bureau has recently issued result of the census of manufacturers of Oregon in 1914, showing that total capital employed during the year was \$139,000,000, and the value of manufactured products, \$109,000,000. Increases compared with prior census of 1909 show: Horsepower, 25 per cent; capital, 56 per cent; salaries, 40 per cent; material, 25 per cent; and value of products 18 per cent.

Harry Whitney Treat, Seattle capitalist, associated with Edgar Ames, Seattle, and the Union Iron Works of San Francisco, have practically completed plans for the construction at Salmon Bay of a fresh-water drydock, which will a little later be enlarged to include a shipbuilding plant for wooden vessels.

The Vandalia Machine & Welding Works, Vandalia, Mont., has under construction a brick machine shop and foundry. Daniel McKay, manager of the Glasgow Brick Company, Glasgow, Mont., is in charge.

The St. Helens Shipbuilding Company, Portland, has contracted to construct a lumber carrier costing \$135,000 for the California & Oregon Lumber Company, Brookings, Cal. The vessel will be on the lines of a steam schooner, motive power to be two Bolinder engines of 20 hp. each driving twin screws, and will have a capacity of 650,000 ft. of lumber. It is to be completed within eight months.

The Wallace Shipyards, North Vancouver, B. C., has obtained contract for the first steel ocean-going steamer to be built in British Columbia. The vessel will be 315 ft. long, with carrying capacity of 5000 tons, and is being constructed for a foreign connection of Dignwall, Cotts & Co., of London, England, with branch office in Pacific Block, Vancouver, B. C.

The Bradley Mfg. Company, Tacoma, Wash., R. L. Bradley, president, will establish a plant in Stellacoom, Wash., for the manufacture of a patented folding berth for automobiles. The enterprise is being backed by the Tacoma Commercial Club and Chamber of Commerce.

The shipbuilding firm of Kruse & Banks, North Bend, Ore., is back of a project to reopen the old mill of the Simpson Lumber Company and put it in operation with a capacity of 60,000 ft. of lumber daily. The shipbuilding company plans to secure its ship timbers from the mill, and to enlarge its shipbuilding plant so that a total of five vessels may be built at one time instead of two as at present.

The Northwest Steel Company and the Willamette Iron & Steel Works, Portland, Ore., associated in the construction of steel steamers, announce that a contract for building a fourth vessel has been signed. The boat is for Norwegian owners.

The Lituya Bay Mining & Dredging Company, Juneau, Alaska, has been incorporated for \$400,000 by Harry Williams and Roland Williams of Juneau, and Frank Cook of Spokane. The company plans to install dredges on its Lituya Bay properties.

R. G. Smythe, associated with Frank B. Waite, a capitalist of Sutherlin, Ore., plans the establishment of a coal briquetting plant in the vicinity of Sutherlin, which will have capacity of 250 tons daily. The company to be organized will have a capitalization of \$320,000.

The Washington Stave Silo Company, Olympia, Wash., plans the erection of a plant on Stevens Street, Olympia, for the manufacture of concrete staves.

The Colfax Iron Works, Colfax, Wash., has let contracts for the immediate construction of its plant in Colfax to W. J. Morrell.

The plants of William G. Martin & Co., manufacturers of sashes and doors, and Mitchell's Sheet Metal Works, both of Port Angeles, Wash., were completely destroyed by fire, with a loss of about \$10,000. Both manufacturing companies state that new plants will be installed.

The pattern plant of the Puget Sound Iron & Steel Works, Tacoma, Wash., was completely destroyed by fire on May 25 with a loss of more than \$200,000. Eugene Roberts is vice-president.

Canada

TORONTO, June 5, 1916.

Steel shipbuilding on a large scale has been started in Nova Scotia by the Nova Scotia Steel Company, which is establishing a plant at New Glasgow, N. S., near the plant of the Eastern Car Company. Steamers are to be built for the Steel Company itself at first, in order to supply the need for additional ocean tonnage.

H. H. Elliott, secretary-treasurer, The Pas, Man., is receiving bids until June 22 for two sewage lift pumps, etc. Murphy & Underwood, Saskatoon, Sask., are the consulting engineers.

It is reported that a plant for the manufacture of auto-tractors will be built at Essex, Ont., by E. C. Dennert, care Hill Brothers, Essex, Ont.

The Dominion Bridge Company, Lachine, Que., is building an extension to its copper mill at a cost of \$10,000, and is building a new forge shop at a cost of \$7,000.

F. Callendar, Guelph, Ont., will erect a foundry at once, to cost \$7,000.

The Lake of the Woods Milling Company has awarded a contract to Carter-Halls-Aldinger & Co., 1010 Union Bank Building, Winnipeg, Man., for the erection of a flour mill at Medicine Hat, Alberta, to cost \$200,000.

The McKinnon Dash & Hardware Company, St. Catharines, Ont., has let a contract for the erection of a factory to cost \$10,000.

The pumphouse at Wainwright, Alberta, owned by the Grand Trunk Pacific Railway Company, Winnipeg, which was destroyed by fire with a loss of about \$10,000, will be rebuilt.

The Goodyear Tire & Rubber Company, Ltd., Toronto, is building a plant in Toronto, to be used exclusively for the manufacture of pneumatic tires. Its other lines of product it will continue to manufacture at Bowmanville, Ont. The tire plant is located on a site of 27 acres, on which it is erecting one building, 100 x 560 ft., four stories and basement. It

will also erect a power plant, a two-story garage and a building for the manufacture of cement. The investment, including equipment, will be between \$1,250,000 and \$1,500,000. C. H. Carlisle is treasurer and general manager.

The Ha Ha Bale Sulphite Company, Chicoutimi, Que., has awarded contract for the construction of its paper pulp plant at Bagotville, Que., to the J. G. White Engineering Company, 43 Exchange Place, New York. Hardy S. Ferguson, 200 Fifth Avenue, New York, is the engineer. The initial installation will have a capacity of 120 tons of sulphite pulp per day. The mill buildings, of brick, concrete and steel, will be erected on Ha Ha Bay, on the Saguenay River, and will occupy about five acres, and besides railroad facilities, will be provided with a system of wharves to accommodate ocean-going vessels. It is expected that the plant will be producing pulp early in 1917. J. E. A. Dubuc, president of the North American Pulp & Paper Company, and general manager of the Chicoutimi Pulp and Paper Company, will be president of the new company.

D. B. McDonnell, Winnipeg, Man., has been authorized to construct a waterpower project at Grant Rapids, on the Saskatchewan River. The power will be used to operate a pulp and paper mill nearby. The promoters will spend \$150,000 within two years and at least 5000 hp. is the ultimate output planned.

Orillia, Ont., will proceed at once with the completion of the power plant at Swift Rapids, and will require a water wheel, transformers and other equipment for two units of 1600 hp. each. The undertaking will cost \$90,000. W. K. Greenwood is engineer.

John Gaudet's wood-working factory and grist mill at Memramcook, N. B., was destroyed by fire with a loss of \$20,000.

T. McAvity & Sons, St. John, N. B., is having a munitions plant erected at St. John which will later be used as a machine shop and brass works. It is reported that the buildings will be completed by Aug. 1, and will cost \$100,000.

The Provincial Government, British Columbia, will bring in a bill shortly making a special grant of \$40,000 for the purchase of machinery for treatment of zinc ore at the experimental plant at Nelson, B. C. Thomas Taylor is minister of public works at Victoria, B. C.

The Disappearing Propeller Boat Company, Ltd., Toronto, has been incorporated with a capital stock of \$45,000 by Frank W. Callaghan, William A. Menton, Neil H. Wilson, and others.

The Meaford Wheelbarrow Company, Ltd., Meaford, Ont., is in the market for a bandsaw with re-saw attachment, etc.

The Elmira Planing Mill Company, Ltd., Elmira, Ont., has been incorporated with a capital stock of \$40,000 by William J. Letson, Woolwich, Ont.; Jacob Bauman, Emanuel G. Martin, and others, of Elmira, to manufacture doors, sashes, etc.

E. F. W. Salisbury, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by George H. Shaver, Ernest A. Harris, Joseph A. Clermont, and others, to manufacture machinery, electrical supplies, etc.

The Contractors' Equipment Company, Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by Robert E. Fennell, John S. McLaughlin, Frederick E. Earl, and others.

The Fort William Terminal Development Company, Ltd., Fort William, Ont., has been incorporated with a capital stock of \$250,000 by Alexander J. McComber, Gerald A. McTeigue, William F. Langworthy, and others, all of Port Arthur, Ont., to erect factories, etc.

The Standard Terminal Company, Ltd., Fort William, Ont., has been incorporated with a capital stock of \$250,000 by William F. Langworthy, Alexander J. McComber, and others, of Port Arthur, Ont., to build and operate flour mills, elevators, etc.

The Hamilton Shipbuilding & Ferry Company, Ltd., Hamilton, Ont., has been incorporated with a capital stock of \$100,000 by John G. Gauld, Ewart B. Binkley, Cecil V. Langs, and others, to build and operate ships, ferries, etc.

The Port Hope File Mfg. Company, Ltd., Port Hope, Ont., has been incorporated with a capital stock of \$40,000 by William G. Brown, William Embleton, Edwin H. Gogarty, and others, to manufacture files, etc. It has secured a building which is being remodelled and equipped.

The Macier Motor Car Company, Ltd., Toronto, has been incorporated with a capital stock of \$750,000 by Warren K. Cook, Frank C. Virtue, Frank J. Foley, and others, to manufacture motors, automobiles, flying machines, etc.

The Canada Stove & Foundry Company, Ltd., Montreal, has been incorporated with a capital stock of \$1,500,000 by Edgar R. Parkins, Ralph E. Allan, Frederick W. Toffield, and others.

The Supplies Company of Canada, Ltd., Ottawa, has been incorporated with a capital stock of \$40,000 by James B. O'Brien, Renfrew, Ont.; Harry W. Sherwood, Andrew Welch, and others, of Ottawa, to manufacture photographic apparatus, etc.

The Barnes Construction Company, Ltd., Montreal, has been incorporated with a capital stock of \$5,000 by Francis G. Bush, Frank B. Common, George R. Drennan, and others, to manufacture automatic sprinklers, fire prevention apparatus and devices.

The City Council of Sherbrooke, Que., has passed a by-law making it compulsory for all manufacturing plants in the city using soft coal to install smoke consumers. As there are a number of plants in the city which must comply with this by-law there will be a considerable demand for smoke consumers.

The Solid Leather Company, Preston, Ont., is completing plans for the erection of an addition to its plant to cost \$25,000.

Plans are in preparation by E. Leonard & Sons, London, Ont., for a 70 x 70 ft. brick addition to their boiler and engine works and shell factory on York Street to cost \$30,000.

Government Purchases

WASHINGTON, D. C., June 5, 1916.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, schedule 9740, for two 1 to 1½-in. full automatics, one portable floor crane and hoist, two sensitive assembly drilling machines, two ball-bearing bench drilling machines, one sliding-head 20 to 23-in. drilling machine, two 10-spindle turret drilling machines, one oil extractor, one chuck hole grinding machine, one universal cutter and tool grinding machine, one drill grinding machine, one tool grinding machine, eight 7-in. swing bench lathes, eighteen engine lathes, ten turret lathes, one filing, sawing and lapping machine, one surface grinding machine, one buffing or polishing machine, one vertical riveting machine, two universal grinding machines, fourteen milling machines, six polishing and finishing machines, two 2-spindle profiling machines, eight screw machines, two horizontal tapping machines, two turret machines, one inclinable open-back power press, one hand screw press, seven sensitive drill presses, six shaft-straightening presses, one double automatic saw-sharpening machine, and one semi-automatic screw-slotting machine, all for Newport; schedule 9750, for three pipe-threading and cutting-off machines for Philadelphia; schedule 9752, for one set of large plate-bending rolls for Mare Island.

The United States Engineer Office, Seattle, Wash., will receive sealed proposals until 11 a. m., July 1, for one gantry cantilever crane and equipment.

The general purchasing office of the Panama Canal, Washington, will receive proposals until 10.30 a. m., June 28, under Panama circular 1049, for pipe-bending machines.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, May 29, for supplies for the navy yards as follows:

Schedule 9577, Ordnance

Class 21, Puget Sound—One electric locomotive and spare parts—Bid 55, \$11,414.

Alternate—Same f.o.b. works—Bid 55, \$10,858.50; 154, \$11,355 and \$9,597.

Schedule 9622, Construction and Repair

Class 144, Brooklyn—One angle bar planing machine—Bid 65, \$4,750.

Schedule 9623, Construction and Repair

Class 151, Brooklyn—One turret lathe—Bid 53, \$3,478; 140, \$4,744.50 and \$5,391.50; 149, \$6,318.

Class 152, Brooklyn—One band saw—Bid 33, \$294; 48, \$303; 80, \$241.80; 88, \$175 and \$267; 105, \$168; 116, \$295; 148, \$309; 155, \$260.75; 164, \$260.50.

Class 153, Brooklyn—One surface planing machine and three extra sets of knives—Bid 33, \$694; 48, \$751.55; 80, \$638.80; 116, \$623.50; 148, \$1,597; 153, \$862.15; 164, \$712.70. The names of the bidders and the numbers under which they are designated in the above list, are as follows:

Bid 33, Carroll Electric Company; 48, J. A. Fay & Egan Company; 53, Gisholt Machine Company; 55, General Electric Company; 65, Hilles-Jones Company; 80, Kemp Machinery Company; 88, Manning, Maxwell & Moore, Inc.; 105, D. Nast Machinery Company; 116, Oliver Machine Company; 140, Sherritt & Stoer Company; 148, Universal Trading Company; 149, Vandyck-Churchill Company; 153, S. A. Woods Machine Company; 154, Westinghouse Electric & Mfg. Company; 155, West Side Iron Works; 164, American Woodworking Machinery Company.

